# Cisco 10000 Series Routers Line Card Hardware Installation Guide

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**About This Guide** xi

Document Revision History xi

Audience xi

Purpose xii

Organization xii

Document Conventions xii

Warning Definition xiv

Related Documentation xix

Obtaining Documentation, Obtaining Support, and Security Guidelines xix

PART 1 **ATM Line Cards**

CHAPTER 1 **4-Port OC-3/STM-1 ATM Line Card Overview** 1-1

Line Card Summary 1-1

Software and Hardware Compatibility 1-2

Line Card, Router, and Processor Compatibility 1-3

LEDs 1-3

Physical Specifications 1-4

Slot Locations 1-5

Cables and Connectors 1-6

CHAPTER 2 **8-Port E3/DS3 ATM Line Card Overview** 2-1

Line Card Summary 2-1

Software and Hardware Compatibility 2-2

Line Card, Router, and Processor Compatibility 2-3

LEDs 2-3

Physical Specifications 2-4

Slot Locations 2-5

Cables and Connectors 2-6

CHAPTER 3 **1-Port OC-12 ATM Line Card Overview** 3-1

Line Card Summary 3-1

Software and Hardware Compatibility 3-2
Line Card, Router, and Processor Compatibility 3-2
LEDs 3-3
Physical Specifications 3-4
Slot Locations 3-5
Cables and Connectors 3-6

PART 2 Channelized Line Cards

CHAPTER 4 4-Port Channelized T3 Half-Height Line Card Overview 4-1
Line Card Summary 4-1
Software and Hardware Compatibility 4-2
Line Card, Router, and Processor Compatibility 4-2
LEDs 4-3
Physical Specifications 4-4
Slot Locations 4-5
Cables and Connectors 4-6
Cables 4-6
Optional Y-Cables 4-7
Configuration Summary 4-9

CHAPTER 5 24-Port Channelized E1/T1 Line Card Overview 5-1
Line Card Summary 5-1
E1 Features 5-2
T1 Features 5-2
Software and Hardware Compatibility 5-3
Line Card, Router, and Processor Compatibility 5-4
LEDs 5-4
Physical Specifications 5-5
Slot Locations 5-6
Cables, Connectors, and Pinouts 5-7
Using the BNC Cable Adapter 5-8
Pinouts 5-9

CHAPTER 6 1-Port Channelized OC-12/STM-4 Line Card Overview 6-1
Line Card Summary 6-2
Software and Hardware Compatibility 6-3

Line Card, Router, and Processor Compatibility 6-3
LEDs 6-3
Physical Specifications 6-4
Slot Locations 6-5
Cables and Connectors 6-7

CHAPTER 7 **4-Port Channelized OC-3/STM-1 Line Card Overview** 7-1
Line Card Summary 7-2
Software and Hardware Compatibility 7-3
Line Card, Router, and Processor Compatibility 7-3
LEDs 7-3
Physical Specifications 7-5
Slot Locations 7-6
Cables and Connectors 7-8

CHAPTER 8 **6-Port Channelized T3 Line Card Overview** 8-1
Line Card Summary 8-1
Software and Hardware Compatibility 8-2
Line Card, Router, and Processor Compatibility 8-2
LEDs 8-3
Physical Specifications 8-4
Slot Locations 8-5
Cables and Connectors 8-6

PART 3 **Fast Ethernet and Gigabit Ethernet Line Cards**

CHAPTER 9 **8-Port Fast Ethernet Half-Height Line Card Overview** 9-1
Line Card Summary 9-1
Software and Hardware Compatibility 9-2
Line Card, Router, and Processor Compatibility 9-2
LEDs 9-3
Physical Specifications 9-4
Slot Locations 9-5
Cables, Connectors, and Pinouts 9-6
Cable and Connector Information 9-6

Pinouts 9-7

CHAPTER 10 **1-Port Gigabit Ethernet Half-Height Line Card Overview 10-1**

Line Card Summary 10-1
Software and Hardware Compatibility 10-3
Line Card, Router, and Processor Compatibility 10-3
LEDs 10-4
Physical Specifications 10-5
Slot Locations 10-6
Cables and Connectors 10-7
SFP Module Configurations and Specifications 10-9
Related Documentation 10-10
Mode-Conditioning Gigabit Ethernet Patch Cord Description 10-11

CHAPTER 11 **1-Port Gigabit Ethernet Line Card Overview 11-1**

Line Card Summary 11-1
Software and Hardware Compatibility 11-2
Line Card, Router, and Processor Compatibility 11-2
LEDs 11-3
Physical Specifications 11-4
Slot Locations 11-5
Cables and Connectors 11-6
Specifications for the Gigabit Ethernet GBIC Module 11-7
Mode-Conditioning Gigabit Ethernet Patch Cord Description 11-8

PART 4 **Packet over SONET Line Cards**

CHAPTER 12 **6-Port OC-3/STM-1 Packet over SONET Line Card Overview 12-1**

Line Card Summary 12-1
Software and Hardware Compatibility 12-2
Line Card, Router, and Processor Compatibility 12-2
LEDs 12-3
Physical Specifications 12-4
Slot Locations 12-5
Cables and Connectors 12-7

CHAPTER 13 **1-Port OC-12 Packet over SONET Line Card Overview** 13-1
- Line Card Summary 13-1
- Software and Hardware Compatibility 13-2
- Line Card, Router, and Processor Compatibility 13-2
- LEDs 13-3
- Physical Specifications 13-4
- Slot Locations 13-5
- Cables and Connectors 13-7

CHAPTER 14 **1-Port OC-48/STM-16 Packet over SONET Line Card Overview** 14-1
- Line Card Summary 14-1
- Software and Hardware Compatibility 14-2
- Line Card, Router, and Processor Compatibility 14-3
- LEDs 14-3
- Physical Specifications 14-5
- Slot Locations 14-6
- Cables and Connectors 14-7

PART 5 **E3/T3 Unchannelized Line Card**

CHAPTER 15 **8-Port Unchannelized E3/T3 Line Card Overview** 15-1
- Line Card Summary 15-1
- Software and Hardware Compatibility 15-2
- Line Card, Router, and Processor Compatibility 15-2
- LEDs 15-3
- Physical Specifications 15-4
- Slot Locations 15-5
- Cables and Connectors 15-7

PART 6 **Installation**

CHAPTER 16 **Preparing for Installation** 16-1
- Required Tools and Equipment 16-1
- Safety Guidelines 16-1
  - Safety Warnings 16-2
  - Electrical Equipment Guidelines 16-2

Telephone Wiring Guidelines 16-2
Preventing Electrostatic Discharge Damage 16-3
Laser/LED Safety 16-3

CHAPTER 17 **Installing and Removing Line Cards 17-1**
Handling Line Cards 17-1
Online Insertion and Removal 17-2
Preprovisioning Line Card Slots 17-3
Slot and Subslot Locations 17-3
Removing and Installing Line Cards 17-7
Removing the Cisco 10008 Front Cover 17-8
Installing Full-Size Line Cards 17-10
Replacement Installation Guidelines 17-10
Installing Half-Height Line Cards 17-16
Replacement Installation Guidelines 17-16
Installing the Half-Height Line Card Carrier 17-16
Installing a Half-Height Line Card Into a Carrier 17-21
Installing SFP Modules or GBIC Modules 17-26
Guidelines for Using SFP Modules or GBIC Modules 17-26
Installing an SFP Module or GBIC Module 17-27
Installing an SFP Module 17-28
Installing a GBIC Module 17-30
Attaching Cables 17-32
Attaching Multimode and Single-Mode Optical Fiber Cables 17-32
Attaching RJ-45 Ethernet Cables 17-35
Attaching the 24-Port Channelized E1/T1 Line Card Adapter Cable 17-36
Attaching Coaxial Cables 17-37
Attaching the 4-Port Channelized T3 Half-Height Line Card Optional Y-Cables 17-39
Configuration Summary 17-41
Using the Cable-Management Bracket 17-42
Removing an SFP Module or GBIC Module 17-43
Removing Full-Size Line Cards 17-46
Removing Half-Height Line Cards and Carrier 17-51
Removing a Half-Height Line Card 17-51
Removing a Carrier 17-55
Checking the Installation 17-58
Using show Commands to Verify Line Card Status 17-58
Using show Commands to Display Line Card Information 17-59

Using the ping Command to Verify Network Connectivity 17-59
Configuring a Line Card 17-60

CHAPTER 18 **Troubleshooting the Installation 18-1**
ATM Line Card Troubleshooting Information 18-2
Channelized Line Cards Troubleshooting Information 18-6
Fast Ethernet and Gigabit Ethernet Line Card Troubleshooting Information 18-11
Packet Over SONET Line Card Troubleshooting Information 18-20
Unchannelized E3/T3 Line Card Troubleshooting Information 18-23
Cleaning the Fiber-Optic Connections 18-24
Checking Flow Control 18-24

APPENDIX A **Cisco 10005 Extender Card Information 19-1**
.Installation Guidelines 19-1
Required Tools and Equipment 19-2
Installing or Replacing Extender Cards 19-2
Installing an Extender Card 19-2
Removing an Extender Card 19-3
Troubleshooting 19-3

INDEX

# About This Guide

## Document Revision History

The Document Revision History table, below, records technical changes to this document.

| Revisoin | Date | Change Summary |
|---|---|---|
| OL-6773-04 | July 2007 | Added 1000BASE-T SFP transceiver module for Category 5 copper wire support for the 1-port Gigabit Ethernet half-height line card. |
| | December 2006 | Added Performance Routing Engine 3 (PRE3) software support information for the following line cards:1-port OC-12 ATM, 1-port channelized OC-12/STM-4, 1-port Gigabit Ethernet half-height, and 1-port Gigabit Ethernet. |
| OL-6773-03 | May 2006 | Added Coarse Wave Division Multiplexer (CWDM) Small Form-Factor Pluggable (SFP) laser optical transceiver module information. |
| OL-6773-02 | March 2006 | Added information about these line cards: 4-port channelized T3 half-height and 4-port OC-3/STM-1 ATM with long-reach optics. |
| OL-6773-01 | July 2005 | This document contains all of the Cisco 10000 series routers line card information previously documented in individual documents, including the Cisco 10005 extender card and alarm card document.<br><br>Regulatory compliance and safety information has moved to the new *Regulatory Compliance and Safety Information for the Cisco 10000 Series Routers.* |

## Audience

The *Cisco 10000 Series Routers Line Card Hardware Installation Guide* is written for the person who installs, configures, and maintains a Cisco 10000 series router.

The user must be familiar with electronic circuitry and wiring practices and have experience as an electronic or electromechanical technician.

# Purpose

This guide presents hardware installation and basic configuration procedures for the Cisco 10000 line cards and includes the following information:

- Line card overview, specifications, and compatibility
- Installing the hardware
- Starting up the router
- Configuring basic functionality

# Organization

The *Cisco 10000 Series Routers Line Card Hardware Installation Guide* is organized as follows:

| Chapter/Appendix Number | Title | Description |
|---|---|---|
| Chapters 1 to 15 | Product Overview | Each chapter provides overview information for a specific Cisco 10000 series router line card, including minimum software release information, hardware and software compatibility information, specifications, cabling information, and LED information |
| Chapter 16 | Preparing for Installation | This chapter contains information on tools requirements, safety guidelines, site requirements for power, environmental safety, and electrostatic discharge (ESD). |
| Chapter 17 | Installing and Removing Line Cards | This chapter contains the instructions for installing and removing line cards in the Cisco 10000 series routers. |
| Chapter 18 | Troubleshooting the Installation | This chapter provides hardware troubleshooting information. |
| Appendix A | Cisco 10005 Extender Card Information | This appendix provides information about the Cisco 10005 extender card, including information about removing and installing it. |

# Document Conventions

This document uses the following conventions:

| Convention | Description |
|---|---|
| ^ or Ctrl | The ^ and Ctrl symbols represent the Control key. For example, the key combination ^D or Ctrl-D means hold down the Control key while you press the D key. Keys are indicated in capital letters but are not case sensitive. |
| *string* | A string is a nonquoted set of characters shown in italics. For example, when setting an SNMP community string to public, do not use quotation marks around the string or the string will include the quotation marks. |

Command syntax descriptions use the following conventions:

| Convention | Description |
|---|---|
| **bold** | Bold text indicates commands and keywords that you enter literally as shown. |
| *italics* | Italic text indicates arguments for which you supply values. |
| [x] | Square brackets enclose an optional element (keyword or argument). |
| \| | A vertical line indicates a choice within an optional or required set of keywords or arguments. |
| [x \| y] | Square brackets enclosing keywords or arguments separated by a vertical line indicate an optional choice |
| {x \| y} | Braces enclosing keywords or arguments separated by a vertical line indicate a required choice. |

Nested sets of square brackets or braces indicate optional or required choices within optional or required elements. For example:

| Convention | Description |
|---|---|
| [x {y \| z}] | Braces and a vertical line within square brackets indicate a required choice within an optional element. |

Examples use the following conventions:

| Convention | Description |
|---|---|
| `screen` | Examples of information displayed on the screen are set in Courier font. |
| `bold screen` | Examples of text that you must enter are set in Courier bold font. |
| `< >` | Angle brackets enclose text that is not printed to the screen, such as passwords. |
| ! | An exclamation point at the beginning of a line indicates a comment line. (Exclamation points are also displayed by the Cisco IOS software for certain processes.) |
| `[ ]` | Square brackets enclose default responses to system prompts. |

The following conventions are used to attract the attention of the reader:

**Caution** Means reader be careful. In this situation, you might do something that could result in equipment damage or loss of data.

**Note** Means reader take note. Notes contain helpful suggestions or references to materials not contained in this manual.

# Warning Definition

**Warning** **IMPORTANT SAFETY INSTRUCTIONS**

**This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device.** Statement 1071

**SAVE THESE INSTRUCTIONS**

**Waarschuwing** **BELANGRIJKE VEILIGHEIDSINSTRUCTIES**

**Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van de standaard praktijken om ongelukken te voorkomen. Gebruik het nummer van de verklaring onderaan de waarschuwing als u een vertaling van de waarschuwing die bij het apparaat wordt geleverd, wilt raadplegen.**

**BEWAAR DEZE INSTRUCTIES**

**Varoitus** **TÄRKEITÄ TURVALLISUUSOHJEITA**

**Tämä varoitusmerkki merkitsee vaaraa. Tilanne voi aiheuttaa ruumiillisia vammoja. Ennen kuin käsittelet laitteistoa, huomioi sähköpiirien käsittelemiseen liittyvät riskit ja tutustu onnettomuuksien yleisiin ehkäisytapoihin. Turvallisuusvaroitusten käännökset löytyvät laitteen mukana toimitettujen käännettyjen turvallisuusvaroitusten joukosta varoitusten lopussa näkyvien lausuntonumeroiden avulla.**

**SÄILYTÄ NÄMÄ OHJEET**

**Attention** **IMPORTANTES INFORMATIONS DE SÉCURITÉ**

**Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant entraîner des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers liés aux circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions des avertissements figurant dans les consignes de sécurité traduites qui accompagnent cet appareil, référez-vous au numéro de l'instruction situé à la fin de chaque avertissement.**

**CONSERVEZ CES INFORMATIONS**

**Warnung** **WICHTIGE SICHERHEITSHINWEISE**

**Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu Verletzungen führen kann. Machen Sie sich vor der Arbeit mit Geräten mit den Gefahren elektrischer Schaltungen und den üblichen Verfahren zur Vorbeugung vor Unfällen vertraut. Suchen Sie mit der am Ende jeder Warnung angegebenen Anweisungsnummer nach der jeweiligen Übersetzung in den übersetzten Sicherheitshinweisen, die zusammen mit diesem Gerät ausgeliefert wurden.**

**BEWAHREN SIE DIESE HINWEISE GUT AUF.**

**Avvertenza** **IMPORTANTI ISTRUZIONI SULLA SICUREZZA**

**Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di intervenire su qualsiasi apparecchiatura, occorre essere al corrente dei pericoli relativi ai circuiti elettrici e conoscere le procedure standard per la prevenzione di incidenti. Utilizzare il numero di istruzione presente alla fine di ciascuna avvertenza per individuare le traduzioni delle avvertenze riportate in questo documento.**

**CONSERVARE QUESTE ISTRUZIONI**

**Advarsel** **VIKTIGE SIKKERHETSINSTRUKSJONER**

**Dette advarselssymbolet betyr fare. Du er i en situasjon som kan føre til skade på person. Før du begynner å arbeide med noe av utstyret, må du være oppmerksom på farene forbundet med elektriske kretser, og kjenne til standardprosedyrer for å forhindre ulykker. Bruk nummeret i slutten av hver advarsel for å finne oversettelsen i de oversatte sikkerhetsadvarslene som fulgte med denne enheten.**

**TA VARE PÅ DISSE INSTRUKSJONENE**

**Aviso** **INSTRUÇÕES IMPORTANTES DE SEGURANÇA**

**Este símbolo de aviso significa perigo. Você está em uma situação que poderá ser causadora de lesões corporais. Antes de iniciar a utilização de qualquer equipamento, tenha conhecimento dos perigos envolvidos no manuseio de circuitos elétricos e familiarize-se com as práticas habituais de prevenção de acidentes. Utilize o número da instrução fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham este dispositivo.**

**GUARDE ESTAS INSTRUÇÕES**

**¡Advertencia!** **INSTRUCCIONES IMPORTANTES DE SEGURIDAD**

**Este símbolo de aviso indica peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considere los riesgos de la corriente eléctrica y familiarícese con los procedimientos estándar de prevención de accidentes. Al final de cada advertencia encontrará el número que le ayudará a encontrar el texto traducido en el apartado de traducciones que acompaña a este dispositivo.**

**GUARDE ESTAS INSTRUCCIONES**

**Varning!** **VIKTIGA SÄKERHETSANVISNINGAR**

**Denna varningssignal signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanliga förfaranden för att förebygga olyckor. Använd det nummer som finns i slutet av varje varning för att hitta dess översättning i de översatta säkerhetsvarningar som medföljer denna anordning.**

**SPARA DESSA ANVISNINGAR**

**Figyelem** **FONTOS BIZTONSÁGI ELOÍRÁSOK**

**Ez a figyelmezeto jel veszélyre utal. Sérülésveszélyt rejto helyzetben van. Mielott bármely berendezésen munkát végezte, legyen figyelemmel az elektromos áramkörök okozta kockázatokra, és ismerkedjen meg a szokásos balesetvédelmi eljárásokkal. A kiadványban szereplo figyelmeztetések fordítása a készülékhez mellékelt biztonsági figyelmeztetések között található; a fordítás az egyes figyelmeztetések végén látható szám alapján keresheto meg.**

**ORIZZE MEG EZEKET AZ UTASÍTÁSOKAT!**

**Предупреждение** **ВАЖНЫЕ ИНСТРУКЦИИ ПО СОБЛЮДЕНИЮ ТЕХНИКИ БЕЗОПАСНОСТИ**

**Этот символ предупреждения обозначает опасность. То есть имеет место ситуация, в которой следует опасаться телесных повреждений. Перед эксплуатацией оборудования выясните, каким опасностям может подвергаться пользователь при использовании электрических цепей, и ознакомьтесь с правилами техники безопасности для предотвращения возможных несчастных случаев. Воспользуйтесь номером заявления, приведенным в конце каждого предупреждения, чтобы найти его переведенный вариант в переводе предупреждений по безопасности, прилагаемом к данному устройству.**

**СОХРАНИТЕ ЭТИ ИНСТРУКЦИИ**

**警告** 重要的安全性说明

此警告符号代表危险。您正处于可能受到严重伤害的工作环境中。在您使用设备开始工作之前，必须充分意识到触电的危险，并熟练掌握防止事故发生的标准工作程序。请根据每项警告结尾提供的声明号码来找到此设备的安全性警告说明的翻译文本。

请保存这些安全性说明

**警告** 安全上の重要な注意事項

「危険」の意味です。人身事故を予防するための注意事項が記述されています。装置の取り扱い作業を行うときは、電気回路の危険性に注意し、一般的な事故防止策に留意してください。警告の各国語版は、各注意事項の番号を基に、装置に付属の「Translated Safety Warnings」を参照してください。

これらの注意事項を保管しておいてください。

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이 경고 기호는 위험을 나타냅니다. 작업자가 신체 부상을 일으킬 수 있는 위험한 환경에 있습니다. 장비에 작업을 수행하기 전에 전기 회로와 관련된 위험을 숙지하고 표준 작업 관례를 숙지하여 사고를 방지하십시오. 각 경고의 마지막 부분에 있는 경고문 번호를 참조하여 이 장치와 함께 제공되는 번역된 안전 경고문에서 해당 번역문을 찾으십시오.

이 지시 사항을 보관하십시오.

**Aviso** **INSTRUÇÕES IMPORTANTES DE SEGURANÇA**

**Este símbolo de aviso significa perigo. Você se encontra em uma situação em que há risco de lesões corporais. Antes de trabalhar com qualquer equipamento, esteja ciente dos riscos que envolvem os circuitos elétricos e familiarize-se com as práticas padrão de prevenção de acidentes. Use o número da declaração fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham o dispositivo.**

**GUARDE ESTAS INSTRUÇÕES**

**Advarsel** **VIGTIGE SIKKERHEDSANVISNINGER**

**Dette advarselssymbol betyder fare. Du befinder dig i en situation med risiko for legemesbeskadigelse. Før du begynder arbejde på udstyr, skal du være opmærksom på de involverede risici, der er ved elektriske kredsløb, og du skal sætte dig ind i standardprocedurer til undgåelse af ulykker. Brug erklæringsnummeret efter hver advarsel for at finde oversættelsen i de oversatte advarsler, der fulgte med denne enhed.**

**GEM DISSE ANVISNINGER**

**تحذير** **إرشادات الأمان الهامة**

**يوضح رمز التحذير هذا وجود خطر. وهذا يعني أنك متواجد في مكان قد ينتج عنه التعرض لإصابات. قبل بدء العمل، احذر مخاطر التعرض للصدمات الكهربائية وكن على علم بالإجراءات القياسية للحيلولة دون وقوع أي حوادث. استخدم رقم البيان الموجود في أخر كل تحذير لتحديد مكان ترجمته داخل تحذيرات الأمان المترجمة التي تأتي مع الجهاز.**
**قم بحفظ هذه الإرشادات**

**Upozornění** **DŮLEŽITÉ BEZPEČNOSTNÍ POKYNY**

**Tento upozorňující symbol označuje nebezpečí. Jste v situaci, která by mohla způsobit nebezpečí úrazu. Před prací na jakémkoliv vybavení si uvědomte nebezpečí související s elektrickými obvody a seznamte se se standardními opatřeními pro předcházení úrazům. Podle čísla na konci každého upozornění vyhledejte jeho překlad v přeložených bezpečnostních upozorněních, která jsou přiložena k zařízení.**

**USCHOVEJTE TYTO POKYNY**

Προειδοποίηση ΣΗΜΑΝΤΙΚΕΣ ΟΔΗΓΙΕΣ ΑΣΦΑΛΕΙΑΣ

Αυτό το προειδοποιητικό σύμβολο σημαίνει κίνδυνο. Βρίσκεστε σε κατάσταση που μπορεί να προκαλέσει τραυματισμό. Πριν εργαστείτε σε οποιοδήποτε εξοπλισμό, να έχετε υπόψη σας τους κινδύνους που σχετίζονται με τα ηλεκτρικά κυκλώματα και να έχετε εξοικειωθεί με τις συνήθεις πρακτικές για την αποφυγή ατυχημάτων. Χρησιμοποιήστε τον αριθμό δήλωσης που παρέχεται στο τέλος κάθε προειδοποίησης, για να εντοπίσετε τη μετάφρασή της στις μεταφρασμένες προειδοποιήσεις ασφαλείας που συνοδεύουν τη συσκευή.

ΦΥΛΑΞΤΕ ΑΥΤΕΣ ΤΙΣ ΟΔΗΓΙΕΣ

אזהרה **הוראות בטיחות חשובות**

סימן אזהרה זה מסמל סכנה. אתה נמצא במצב העלול לגרום לפציעה. לפני שתעבוד עם ציוד כלשהו, עליך להיות מודע לסכנות הכרוכות במעגלים חשמליים ולהכיר את הנהלים המקובלים למניעת תאונות. השתמש במספר ההוראה המסופק בסופה של כל אזהרה כד לאתר את התרגום באזהרות הבטיחות המתורגמות שמצורפות להתקן.

**שמור הוראות אלה**

Opomena ВАЖНИ БЕЗБЕДНОСНИ НАПАТСТВИЈА

Симболот за предупредување значи опасност. Се наоѓате во ситуација што може да предизвика телесни повреди. Пред да работите со опремата, бидете свесни за ризикот што постои кај електричните кола и треба да ги познавате стандардните постапки за спречување на несреќни случаи. Искористете го бројот на изјавата што се наоѓа на крајот на секое предупредување за да го најдете неговиот период во преведените безбедносни предупредувања што се испорачани со уредот.

ЧУВАЈТЕ ГИ ОВИЕ НАПАТСТВИЈА

**Ostrzeżenie** **WAŻNE INSTRUKCJE DOTYCZĄCE BEZPIECZEŃSTWA**

**Ten symbol ostrzeżenia oznacza niebezpieczeństwo. Zachodzi sytuacja, która może powodować obrażenia ciała. Przed przystąpieniem do prac przy urządzeniach należy zapoznać się z zagrożeniami związanymi z układami elektrycznymi oraz ze standardowymi środkami zapobiegania wypadkom. Na końcu każdego ostrzeżenia podano numer, na podstawie którego można odszukać tłumaczenie tego ostrzeżenia w dołączonym do urządzenia dokumencie z tłumaczeniami ostrzeżeń.**

**NINIEJSZE INSTRUKCJE NALEŻY ZACHOWAĆ**

**Upozornenie** **DÔLEŽITÉ BEZPEČNOSTNÉ POKYNY**

**Tento varovný symbol označuje nebezpečenstvo. Nachádzate sa v situácii s nebezpečenstvom úrazu. Pred prácou na akomkoľvek vybavení si uvedomte nebezpečenstvo súvisiace s elektrickými obvodmi a oboznámte sa so štandardnými opatreniami na predchádzanie úrazom. Podľa čísla na konci každého upozornenia vyhľadajte jeho preklad v preložených bezpečnostných upozorneniach, ktoré sú priložené k zariadeniu.**

**USCHOVAJTE SI TENTO NÁVOD**

We recommend that you read and understand the safety warnings and guidelines before installing, configuring, or maintaining the router. See the *Regulatory Compliance and Safety Information for the Cisco 10000 Series Routers* document.

# Related Documentation

For a complete list of all Cisco 10000 series routers documentation, see the online *Cisco 10000 Series Routers Documentation Roadmap*. See also the following documents:

- *Regulatory Compliance and Safety Information for the Cisco 10000 Series Routers*
- *Cisco 10000 Series Router Line Card Configuration Guide*
- *Cisco 10000 Series Router Performance Routing Engine Installation*

# Obtaining Documentation, Obtaining Support, and Security Guidelines

For information on obtaining documentation, obtaining support, providing documentation feedback, security guidelines, and also recommended aliases and general Cisco documents, see the monthly *What's New* in Cisco Product Documentation, which also lists all new and revised Cisco technical documentation, at:

http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html

PART 1

# ATM Line Cards

# 4-Port OC-3/STM-1 ATM Line Card Overview

This chapter describes the Cisco 10000 series 4-port OC-3/STM-1c ATM line card (referred to as the 4-port OC-3/STM-1 ATM line card), and contains the following sections:


- Line Card Summary, page 1-1
- Software and Hardware Compatibility, page 1-2
- Line Card, Router, and Processor Compatibility, page 1-3
- LEDs, page 1-3
- Physical Specifications, page 1-4
- Slot Locations, page 1-5
- Cables and Connectors, page 1-6


## Line Card Summary

*Table 1-1 4-Port OC-3/STM-1 ATM Line Card Summary*

| Product Number | Description | Minimum Cisco IOS Release |
|---|---|---|
| ESR-4OC3-ATM-SM= | 4-port OC-3/STM-1 ATM line card with intermediate-reach optics | Initial Cisco IOS releases for PRE-1:<br>12.0(21)SX and later releases of Cisco IOS Release 12.0SX<br>12.0(20)ST and later releases of Cisco IOS Release 12.0ST<br>12.0(22)S and later releases of Cisco IOS Release 12.0S<br>12.2(8)BZ and later releases of Cisco IOS Release 12.2BZ<br>Initial Cisco IOS releases for PRE-2:<br>12.3(7)XI and later releases of<br>12.3XI<br>12.2(15)BX and later releases of<br>12.2BX<br>12.2(28)SB and later releases of Cisco IOS Release 12.2(28)SB |
| ESR-4OC3-ATM-SM-LR= | 4-port OC-3/STM-1 ATM line card with long-reach optics | 12.2(28)SB and later releases of Cisco IOS Release 12.2(28)SB<br>For registered Cisco.com users, use Software Advisor to determine the software releases for this line card. |

The 4-port OC-3/STM-1 ATM line card is a NEBS-compliant device that performs Layer 2 Asynchronous Transfer Mode (ATM) functions. This line card receives and transmits ATM cells on each network physical interface connected to a line card port, and simultaneously transmits and receives packets from the Cisco 10000 series router backplane.

This line card can be used to:

- Provide four OC-3 trunk uplinks
- Provide IP packet routing over ATM virtual circuit connections using single-mode fiber intermediate reach and long reach LC connectors at each port
- Operate as a subscriber interface card

The 4-port OC-3/STM-1 ATM line card is an implementation of ATM over SONET switching. This line card supports the following features:

- Conforms to the ATM forum ATM UNI 3.1 155.52-Mbps physical layer specification
- Uses ATM cell header 8-bit virtual path identifiers (VPIs) and 16-bit virtual channel identifiers (VCIs)
- Provides ATM QoS (quality of service) management
- Complies with the SONET/SDH OC-3 STS-3/STM-1 framing format
- Accommodates SONET overhead bits
- Provides up to 8191 total connections
- Provides alarm processing
- Provides continuous performance monitoring

If you are a registered Cisco.com user, see Feature Navigator for supported features.

# Software and Hardware Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether line cards within a system are compatible, but does provide the minimum Cisco IOS requirements for individual hardware line cards, modules, or options.

**Note** Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, click **Login** at Cisco.com, type “Software Advisor” in the SEARCH box, and click **Go**. Click the link for the Software Advisor tool.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

# Line Card, Router, and Processor Compatibility

Table 1-2 provides information about the router model, line card, and processor compatibility.

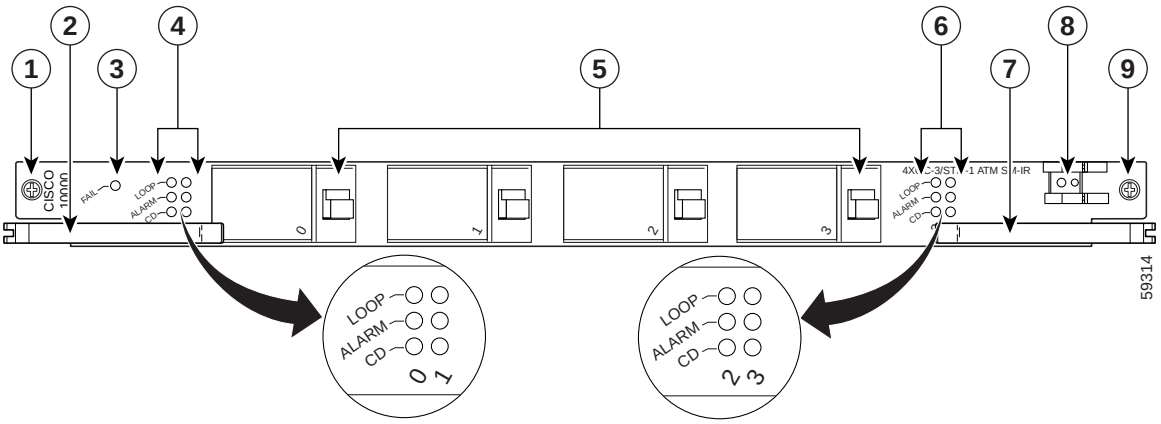
***Table 1-2 Line Card, Router, and Processor Compatibility***

| Line Card | Cisco 10008 | Cisco 10005 | PRE-2 | PRE-1 | PRE |
|---|---|---|---|---|---|
| 4-port OC-3/STM-1 ATM line card ESR-4OC-ATM-SM= | Yes | Yes | Yes | Yes | Yes |
| 4-port OC-3/STM-1 ATM line card ESR-4OC-ATM-SM-LR= | Yes | No | Yes | No | No |

# LEDs

The 4-port OC-3/STM-1 ATM line card LEDs are described in Figure 1-1.

***Figure 1-1 4-Port OC-3/STM-1 ATM Line Card Faceplate Description***




| | | | |
|---|---|---|---|
| 1 | Top captive screw | 6 | Ports 2 and 3 status LED group |
| 2 | Top ejector lever | 7 | Lower ejector lever |
| 3 | Yellow line card Fail LED | 8 | Cable management clip |
| 4 | Ports 0 and 1 Status LED group | 9 | Lower captive screw |
| 5 | Ports 0 to 3 RX and TX connectors | | |

Table 1-3 provides a description of the 4-port OC-3/STM-1 ATM line card LEDs.

***Table 1-3 LED Description***

| LED Label | Color | State | Meaning |
|---|---|---|---|
| FAIL | Yellow | Off | Off when line card is working properly. Turns on for a few seconds during line card power-on self test (POST), then turns off when the line card is working properly. |
| | | On | On when the line card POST fails. |
| LOOP | Yellow | Off | Off when the line card is available for normal operation. |
| | | On | On when some portion of the corresponding port data is in a loopback state and is not available for normal operations. |
| ALARM | Yellow | Off | Off when the line card is operating normally. |
| | | On | On when an alarm condition exists at the corresponding port. |
| CD (carrier detected) | Green | On | On when a carrier is detected at the corresponding port. |
| | | Off | Off when a loss of signal (LOS) is indicated. |

# Physical Specifications

The 4-port OC-3/STM-1 ATM line card physical specifications are shown in Table 1-4:

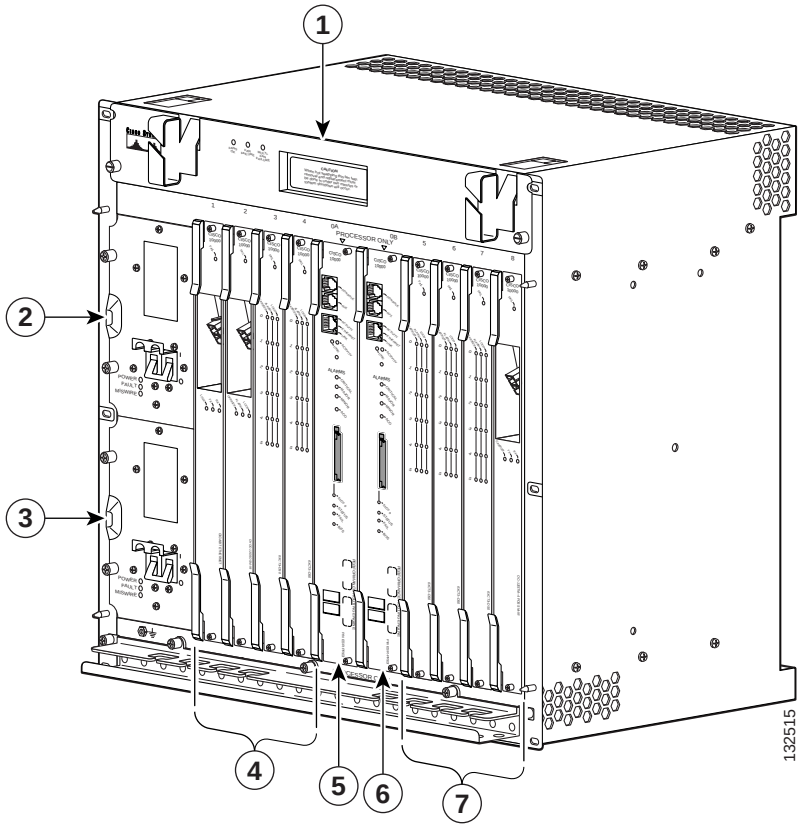
***Table 1-4 4-Port OC-3/STM-1 ATM Line Card Physical Specifications***

| Description | Specifications |
|---|---|
| Physical dimensions | Height: 16.0 in. (40.64 cm)<br>Depth: 9.97 in. (25.32 cm)<br>Width: 1.12 in. (2.83 cm) |
| Shipping weight | Approximately 4.75 lb (2.16 kg) |
| Operating temperature | 41°F to 104°F (5°C to 40°C)<br>Short-term operating temperature is limited to 131°F (55°C) in compliance with Bellcore GR |
| Relative humidity | Operating—nominal: 5% to 85%<br>Operating—short term: 5% to 90%<br>Storage: 5% to 95% |
| Storage temperature | –40°F to 158°F (–40°C to 70C °) |

# Slot Locations

The line card slot designations are shown in this section. Figure 1-2 shows line card slot designations for the Cisco 10008 router and Figure 1-3 shows line card slot designations for the Cisco 10005 router.

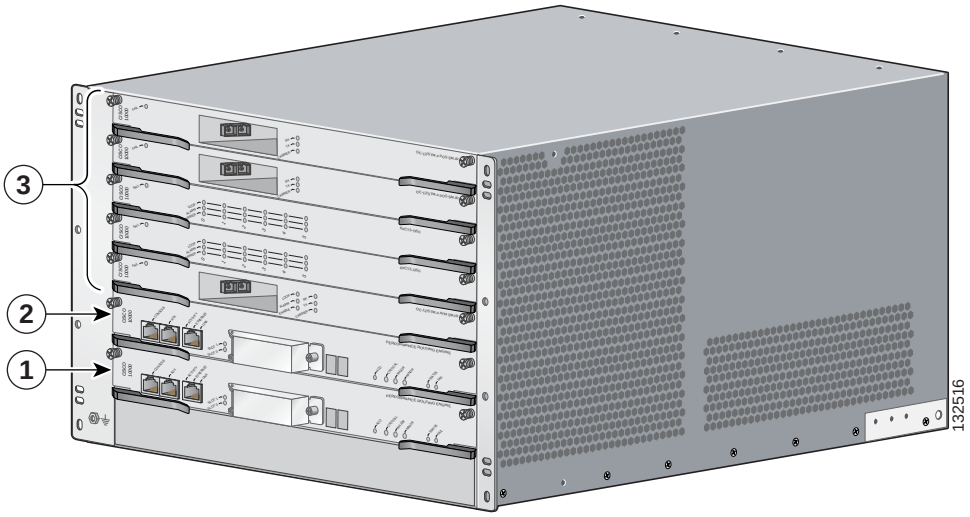
***Figure 1-2 Line Card Slot Designations for the Cisco 10008 Router***




| | | | |
|---|---|---|---|
| **1** | Blower module | **5** | PRE slot 0A |
| **2** | Primary PEM | **6** | PRE slot 0B |
| **3** | Redundant PEM | **7** | Line card slots 5 to 8 |
| **4** | Line card slots 1 to 4 | | |

The 4-port OC-3/STM-1 ATM line card can be installed in line card slot 1 through slot 8.

*Figure 1-3 Line Card Slot Designations for the Cisco 10005 Router*




| | | | |
|---|---|---|---|
| **1** | PRE slot A | **3** | Line card slots 1 (top) to 5 (bottom) |
| **2** | PRE slot B | | |

The 4-port OC-3/STM-1 ATM line card can be installed in line card slot 1 through slot 5.

# Cables and Connectors

Table 1-5 provides optical cable specifications for the line card.

*Table 1-5 Optical Specifications*

| Transceiver Type | Transmit Power | Maximum Power to Receiver | Minimum Receiver Sensitivity | Nominal Distance Between Stations | Wavelength | Fiber Type: Single Mode |
|---|---|---|---|---|---|---|
| Single-mode intermediate reach | –15 dBm minimum to –8 dBm maximum | –8 dBm | –28 dBm | Up to 9 mi (15 km) | 1280 nm to 1335 nm | Core size 8 to 10 microns |
| Single-mode long reach (LR) | –5 dBm minimum to 0 dBm maximum | –10 dBm[1] | –34 dBm | Up to 25 mi (40 km) | 1280 nm to 1335 nm | Core size 8 to 10 microns |

1. For LR, a minimum of 10 dB of total attenuation between transmitter and receiver is required. Exceeding the maximum receive power can damage the optics.

Go to Chapter 16, “Preparing for Installation” to begin the installation or replacement of the line card.

For troubleshooting information, see Chapter 18, “Troubleshooting the Installation.”

# 8-Port E3/DS3 ATM Line Card Overview

This chapter describes the Cisco 10000 series 8-port E3/DS3 ATM line card (referred to as the 8-port E3/DS3 ATM line card) and contains the following sections:


- Line Card Summary, page 2-1
- Software and Hardware Compatibility, page 2-2
- Line Card, Router, and Processor Compatibility, page 2-3
- LEDs, page 2-3
- Physical Specifications, page 2-4
- Slot Locations, page 2-5
- Cables and Connectors, page 2-6


## Line Card Summary

*Table 2-1 8-Port E3/DS3 ATM Line Card Summary*

| Product Number | Description | Minimum Cisco IOS Release |
|---|---|---|
| ESR-8E3DS3-ATM= | 8-port E3/DS3 ATM line card | Initial Cisco IOS releases for PRE-2:<br>12.2(16)BX and later releases of Cisco IOS Release 12.2BX<br>12.2(28)SB and later releases of Cisco IOS Release 12.2(28)SB<br>12.3(7)XI and later releases of Cisco IOS Release 12.3XI<br>For registered Cisco.com users, use Software Advisor to determine the software releases for this line card. |

The 8-port E3/DS3 ATM line card has eight E3 or DS3 (T3) copper interface terminations that provide Asynchronous Transfer Mode (ATM) serial interfaces and perform Layer 2 ATM functions.

Each E3/DS3 interface port on the 8-port E3/DS3 ATM line card provides a single high-speed data channel.

- Maximum E3 bandwidth—34.386 Mbps
- Maximum DS3 bandwidth—44.736 Mbps

The 8-port E3/DS3 ATM line card can be used to:

- Provide eight E3 or DS3 trunk uplinks that support throughput of up to 44.736 Mbps at each port of the line card
- Provide IP packet routing over ATM virtual circuit connections using copper-based E3 or DS3 connectors at each port
- Operate as a subscriber interface card

The ATM features of the 8-port E3/DS3 ATM line card include:

- Broadband aggregation support for up to 8,000 simultaneously active, independent ATM virtual circuits per E3 or DS3 port, with a total limit of 32,000 VCs per line card
- Uses ATM cell header 8-bit virtual path identifiers (VPIs) and 16-bit virtual channel identifiers (VCIs)
- Provides ATM QoS (quality of service) management

If you are a registered Cisco.com user, see Feature Navigator for supported features.

# Software and Hardware Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether line card within a system are compatible, but does provide the minimum Cisco IOS requirements for individual hardware line cards, modules, or options.

**Note** Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, click **Login** at Cisco.com, type “Software Advisor” in the SEARCH box, and click **Go**. Click the link for the Software Advisor tool.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

# Line Card, Router, and Processor Compatibility

Table 2-2 provides information about the router model, line card, and processor compatibility.

***Table 2-2 Line Card, Router, and Processor Compatibility***

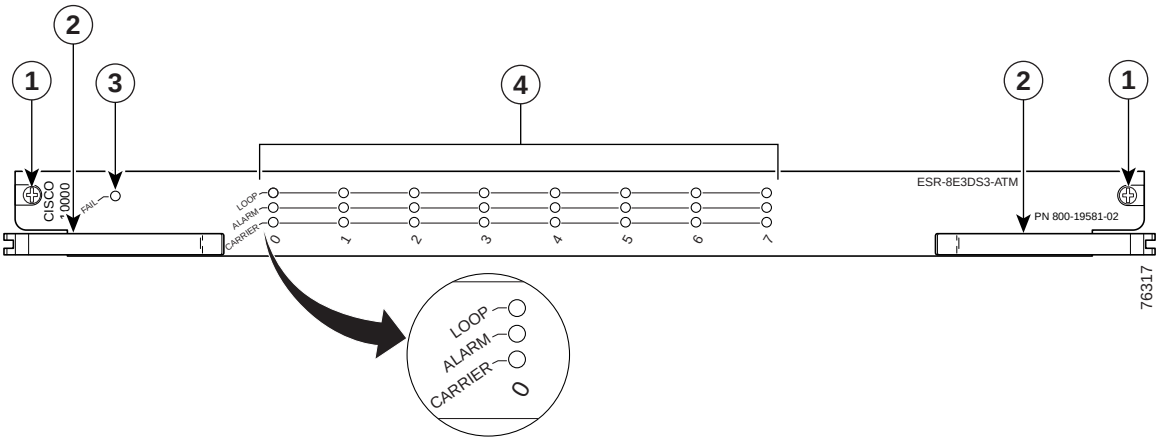
| Line Card | Cisco 10008 | Cisco 10005 | PRE-2 | PRE-1 | PRE |
|---|---|---|---|---|---|
| 8-port E3/DS3 ATM line card | Yes | No[1] | Yes | No | No |

1. The 8-port E3/DS3 ATM line card has been compliance tested to function in a Cisco 10005 chassis.

# LEDs

The 8-port E3/DS3 ATM line card LEDs are described in Figure 2-1.

***Figure 2-1 8-Port E3/DS3 ATM Line Card Faceplate Description***




| | | | |
|---|---|---|---|
| 1 | Captive screw | 3 | Yellow Fail LED |
| 2 | Ejector lever | 4 | Ports 0 to 7 status LEDs: |

Table 2-3 provides a description of the 8-port E3/DS3 ATM line card LEDs.

***Table 2-3 LED Description***

| LED Label | Color | State | Meaning |
|---|---|---|---|
| FAIL | Yellow | Off | Off when line card is working properly. Turns on for a few seconds during line card power-on self test (POST), then turns off when the line card is working properly. |
| | | On | On when the line card POST fails. |
| LOOP | Yellow | Off | Off when the line card is available for normal operation. |
| | | On | On when some portion of the corresponding port data is in a loopback state and is not available for normal operations. |
| ALARM | Yellow | Off | Off when the line card is operating normally. |
| | | On | On when an alarm condition exists at the corresponding port. |
| CARRIER (carrier detected) | Green | On | On when a carrier is detected at the corresponding port and the interface is operating properly. |
| | | Off | Off when a loss of signal (LOS) is indicated. |

# Physical Specifications

The 8-port E3/DS3 ATM line card physical specifications are shown in Table 2-4.

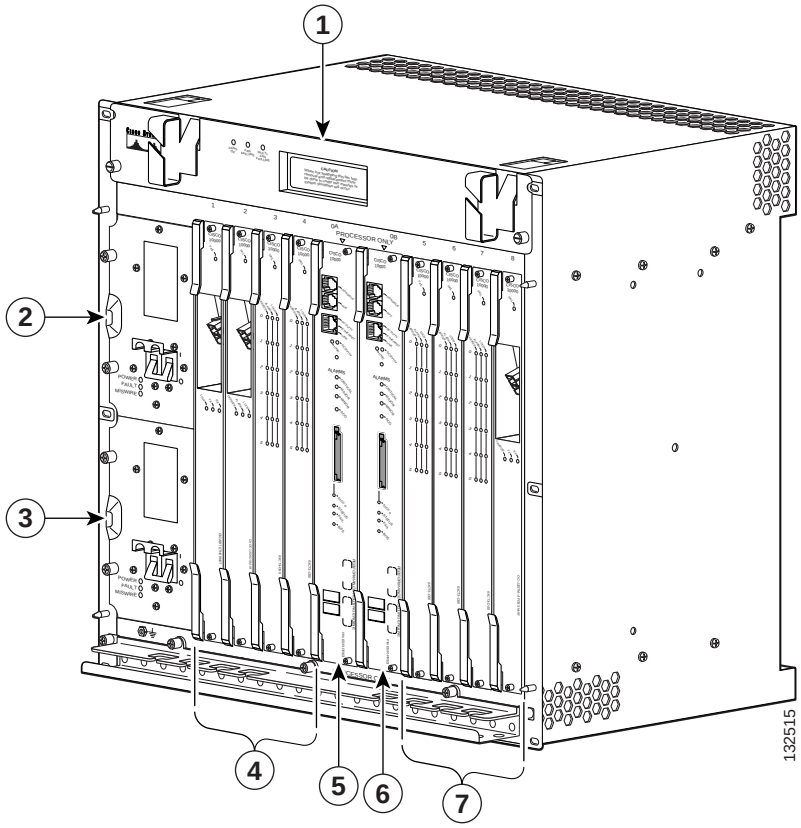
***Table 2-4 8-Port E3/DS3 ATM Line Card Physical Specifications***

| Description | Specifications |
|---|---|
| Physical dimensions | Height: 16.0 in. (40.64 cm)<br>Depth: 9.97 in. (25.32 cm)<br>Width: 1.12 in. (2.83 cm) |
| Shipping weight | Approximately 4.75 lb (2.16 kg) |
| Operating temperature | 41°F to 104°F (5°C to 40°C)<br>Short-term operating temperature is limited to 131°F (55°C) in compliance with Bellcore GR |
| Relative humidity | Operating—nominal: 5% to 85%<br>Operating—short term: 5% to 90%<br>Storage: 5% to 95% |
| Storage temperature | –40°F to 158°F (–40°C to 70C °) |

# Slot Locations

The line card slot designations are shown in this section. Figure 2-2 shows line card slot designations for the Cisco 10008 router and Figure 2-3 shows line card slot designations for the Cisco 10005 router.

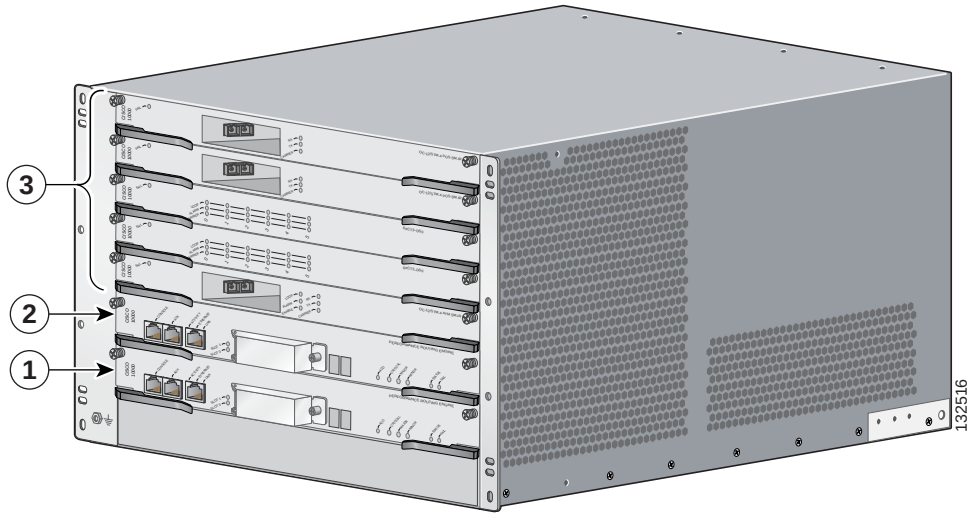
***Figure 2-2 Line Card Slot Designations for the Cisco 10008 Router***




| | | | |
|---|---|---|---|
| **1** | Blower module | **5** | PRE slot 0A |
| **2** | Primary PEM | **6** | PRE slot 0B |
| **3** | Redundant PEM | **7** | Line card slots 5 to 8 |
| **4** | Line card slots 1 to 4 | | |

The 8-port E3/DS3 ATM line card can be installed in slot 1 through slot 8.

*Figure 2-3 Line Card Slot Designations for the Cisco 10005 Router*



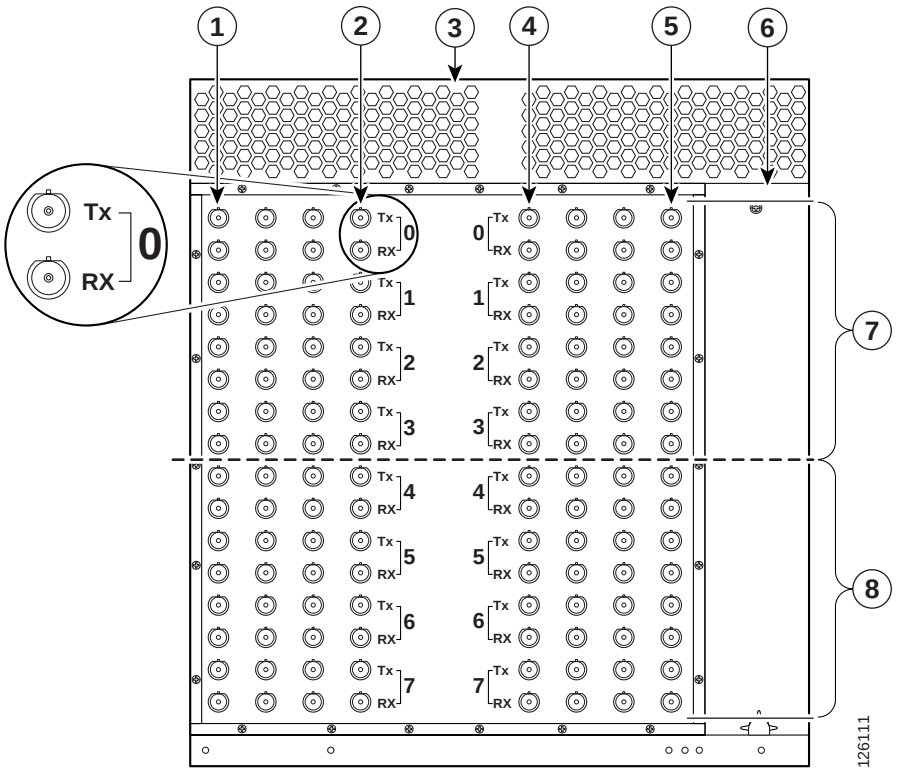

| | | | |
|---|---|---|---|
| **1** | PRE slot A | **3** | Line card slots 1 (top) to 5 (bottom) |
| **2** | PRE slot B | | |

The 8-port E3/DS3 ATM line card can be installed in slot 1 through slot 5.

# Cables and Connectors

External network connections to the 8-port E3/DS3 ATM line card are made through the BNC connectors mounted on the rear of the Cisco 10000 chassis, using 75-ohm coaxial cable. The approved cables for use with the 8-port E3/DS3 ATM line card are cables conforming to WECO standards 728A, 734A, or 734D. Use cable lengths up to 450 ft (137.16 m). 735A cables can be used with lengths up to 225 ft (68.58 m).

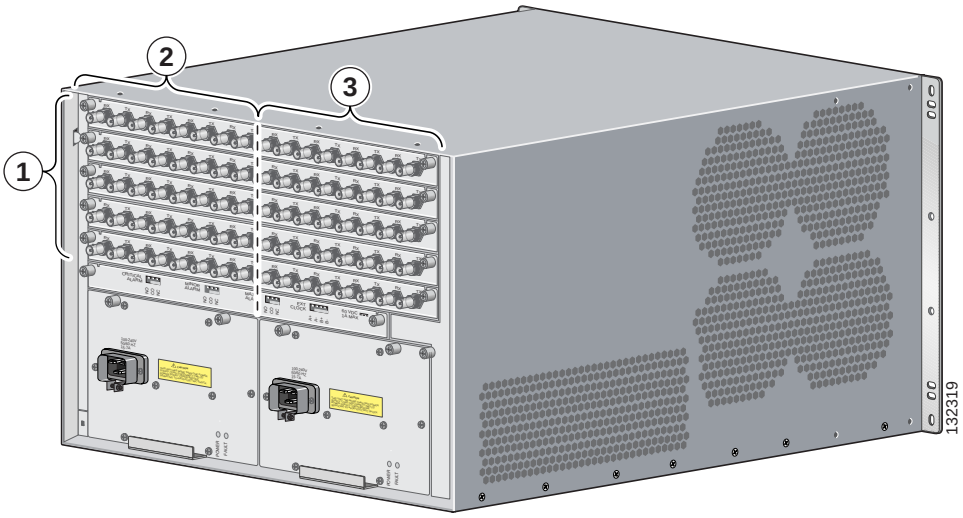
*Figure 2-4 Cisco 10000 Chassis Rear—BNC Connectors*




| | | | |
|---|---|---|---|
| **1** | Line card slot 8 | **5** | Line card slot 1 |
| **2** | Line card slot 5 | **6** | Power supply |
| **3** | Blower module | **7** | Half-height line card subslot 0 |
| **4** | Line card slot 4 | **8** | Half-height line card subslot 1 |

The BNC connectors on the rear of the chassis, which use coaxial cable, are used with the 8-port E3/DS3 ATM line card.

*Figure 2-5 Cisco 10005 Chassis Rear—BNC Connectors*




| | | | |
|---|---|---|---|
| **1** | Line card slots 1 (top) to 5 (bottom) | **3** | Subslots 1/1 (top) to 5/1 (bottom) |
| **2** | Subslot 1/0 (top) to 5/0 (bottom) | | |

Also see Appendix A, "Cisco 10005 Extender Card Information" for information about the extender card which must be used with the 8-port Unchannelized E3/T3 line card in the Cisco 10005 chassis.

All Cisco 10005 ESR cards connect to a backplane in the center of the chassis, and require extender cards to deliver the alarm, BITS clock, and DS3 signals to the rear of the chassis to make them accessible. The Cisco 10005 ESR alarm extender card and T3/E3 extender card extend and terminate these signals.

Go to Chapter 16, "Preparing for Installation" to begin the installation or replacement of the line card.

For troubleshooting information, see Chapter 18, "Troubleshooting the Installation."

# 1-Port OC-12 ATM Line Card Overview

This chapter describes the Cisco 10000 series 1-port OC-12 ATM line card (referred to as the 1-port channelized OC-12 ATM line card), and contains the following sections:


- Line Card Summary, page 3-1
- Software and Hardware Compatibility, page 3-2
- Line Card, Router, and Processor Compatibility, page 3-2
- LEDs, page 3-3
- Physical Specifications, page 3-4
- Slot Locations, page 3-5
- Cables and Connectors, page 3-6


## Line Card Summary

*Table 3-1 1-Port OC-12 ATM Line Card Summary*

| Product Number | Description | Minimum Cisco IOS Release |
|---|---|---|
| ESR-1OC-12-ATM= | 1-port OC-12 ATM line card | Initial Cisco IOS releases for PRE-1:<br>12.0(22)S and later releases of Cisco IOS Release 12.0S<br>Initial Cisco IOS releases for PRE-2:<br>12.0(10)SL and later releases of 12.0SL<br>12.0(22)S and later releases of Cisco IOS Release 12.0S<br>12.2(28)SB and later releases of Cisco IOS Release 12.2(28)SB<br>12.3(7)XI and later releases of Cisco IOS 12.3XI<br>Initial Cisco IOS releases for PRE-3:<br>12.2(31)SB2 and later releases of 12.2SB<br>For registered Cisco.com users, use Software Advisor to determine the software releases for this line card. |

The 1-port OC-12 ATM line card is a trunk uplink for the Cisco 10000series routers that provides IP packet routing over ATM virtual circuit connections using a single-mode fiber intermediate reach SC connector.

The 1-port OC-12 ATM line card is a standard implementation of ATM over SONET switching and supports the following features:

- MPLS
- ATM services
- Alarm processing
- Performance monitoring

If you are a registered Cisco.com user, see Feature Navigator for supported features.

# Software and Hardware Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify if line cards within a system are compatible, but does provide the minimum Cisco IOS requirements for individual hardware line cards, modules, or options.

**Note** Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, click **Login** at Cisco.com, type "Software Advisor" in the SEARCH box, and click **Go**. Click the link for the Software Advisor tool.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

# Line Card, Router, and Processor Compatibility

Table 3-2 provides information about the router model, line card, and processor compatibility.

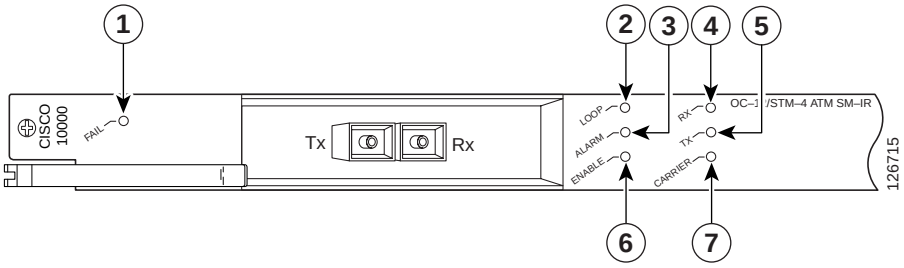
***Table 3-2 Line Card, Router, and Processor Compatibility***

| Line Card | Cisco 10008 | Cisco 10005 | PRE-3 | PRE-2 | PRE-1 | PRE |
|---|---|---|---|---|---|---|
| 1-port OC-12 ATM line card | Yes | Yes | Yes | Yes | Yes | Yes |

# LEDs

The 1-port OC-12 ATM line card LEDs are described in Figure 3-1.

***Figure 3-1 1-Port OC-12 ATM Line Card Faceplate Description***




| | | | |
|---|---|---|---|
| **1** | FAIL LED | **5** | TX LED |
| **2** | LOOP LED | **6** | ENABLE LED |
| **3** | ALARM LED | **7** | CARRIER LED |
| **4** | RX LED | | |

Table 3-3 provides a description of the 1-port OC-12 ATM line card LEDs.

***Table 3-3 LED Description***

| LED Label | Color | State | Meaning |
|---|---|---|---|
| FAIL | Yellow | Off | A major failure has disabled the line card. |
| | | On | On when the line card power-on self test (POST ) fails. |
| LOOP | Yellow | Off | Off when the line card is available for normal operation. |
| | | On | On when some portion of the corresponding port data is in a loopback state and is not available for normal operations. |
| ALARM | Yellow | Off | No alarm condition. |
| | | On | Indicates an alarm condition at the OC-12 level. |
| ENABLE | Green | On | The port is enabled for data traffic. |
| | | Off | The port is not enabled for data traffic. |
| RX | Green | On | The port is receiving traffic. |
| | | Off | The port is not receiving traffic. |
| TX | Green | On | The port is transmitting traffic. |
| | | Off | The port is not transmitting traffic. |
| CARRIER (carrier detected) | Green | On | On when a carrier is detected at the corresponding port. |
| | | Off | Off when a carrier is not detected. |

# Physical Specifications

The 1-port channelized OC-12 ATM line card physical specifications are shown in Table 3-4:

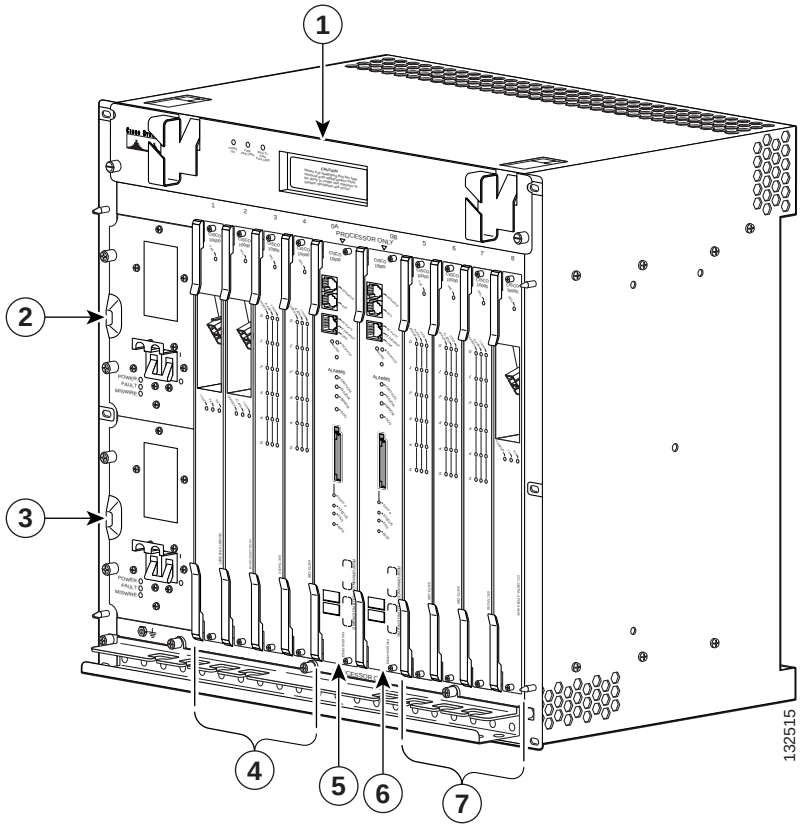
***Table 3-4 1-Port Channelized OC-12 ATM Line Card Physical Specifications***

| Description | Specifications |
|---|---|
| Physical dimensions | Height: 16.0 in. (40.64 cm)<br>Depth: 9.97 in. (25.32 cm)<br>Width: 1.12 in. (2.83 cm) |
| Shipping weight | Approximately 4.75 lb (2.16 kg) |
| Operating temperature | 41°F to 104°F (5°C to 40°C)<br>Short-term operating temperature is limited to 131°F (55°C) in compliance with Bellcore GR |
| Relative humidity | Operating—nominal: 5% to 85%<br>Operating—short term: 5% to 90%<br>Storage: 5% to 95% |
| Storage temperature | –40°F to 158°F (–40°C to 70C °) |

# Slot Locations

The line card slot designations are shown in this section. See Figure 3-2 for line card slot designations for the Cisco 10008 router and Figure 3-3 for line card slot designations for the Cisco 10005 router.

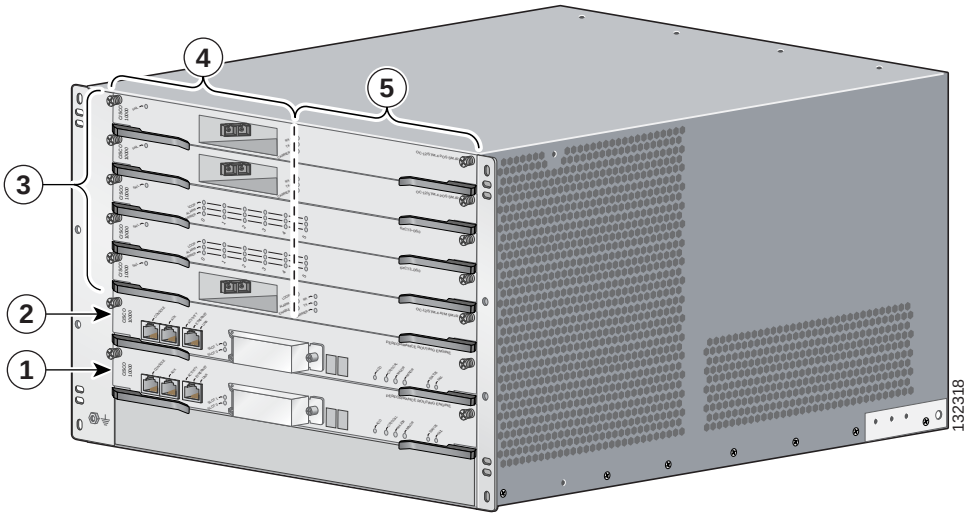
***Figure 3-2 Line Card Slot Designations for the Cisco 10008 Router***




| | | | |
|---|---|---|---|
| **1** | Blower module | **5** | PRE slot 0A |
| **2** | Primary PEM | **6** | PRE slot 0B |
| **3** | Redundant PEM | **7** | Line card slots 5 to 8 |
| **4** | Line card slots 1 to 4 | | |

The 1-port OC-12 ATM line card can be installed in line card slot 1 through slot 8.

*Figure 3-3 Line Card Slot Designations for the Cisco 10005 Router*




| | | | |
|---|---|---|---|
| **1** | PRE slot A | **4** | Line card subslot 1/0 (top) to 5/0 (bottom) |
| **2** | PRE slot B | **5** | Subslots 1/1 (top) to 5/1 (bottom) |
| **3** | Line card slots 1 (top) to 5 (bottom) | | |

The 1-port OC-12 ATM line card can be installed in line card slot 1 through slot 5.

# Cables and Connectors

Table 3-5 provides optical cabling specifications for the line card.

*Table 3-5 Optical Specifications*

| Transceiver Type | Transmit Power | Maximum Power to Receiver | Minimum Receiver Sensitivity | Nominal Distance Between Stations | Wavelength | Fiber Type |
|---|---|---|---|---|---|---|
| Single-mode intermediate reach | –15 dBm minimum to –8 dBm maximum | –8 dBm | –28 dBm | Up to 9 mi (15 km) | 1280 nm to 1335 nm | Single mode, core size 8 to 10 microns |

*Table 3-6 Optical Power Budget*

| Power Budget | Transmit Power | Receive Power | Typical Maximum Distance |
|---|---|---|---|
| 12 dB | –15 to –8 dBm | –18 to –8 dBm | 9.3 miles (15 km) |

Go to Chapter 16, “Preparing for Installation” to begin the installation or replacement of the line card.

For troubleshooting information, see Chapter 18, “Troubleshooting the Installation.”

PART 2

# Channelized Line Cards

# 4-Port Channelized T3 Half-Height Line Card Overview

This chapter describes the Cisco 10000 series 4-port channelized T3 half-height line card (referred to as the 4-port channelized T3 half-height line card), and contains the following sections:


- Line Card Summary, page 4-1
- Software and Hardware Compatibility, page 4-2
- Line Card, Router, and Processor Compatibility, page 4-2
- LEDs, page 4-3
- Physical Specifications, page 4-4
- Slot Locations, page 4-5
- Cables and Connectors, page 4-6


## Line Card Summary

*Table 4-1 4-Port Channelized T3 Half-Height Line Card Summary*

| Product Number | Description | Minimum Cisco IOS Release |
|---|---|---|
| ESR-HH-4CT3= | Half-height line card for the Cisco 10000 series router. It provides four ports of channelized T3 service at full line rate. | 12.2(28)SB and later releases of Cisco IOS Release 12.2(28)SB |
| ESR-HH-CARRIER= | Full-length base carrier for half-slot line card | 12.O(23)S and later releases of Cisco IOS Release 12.OS |
| ESR-HH-COVER= | Blank filler for half-height line cards | — |
| CAB-BNC-7INY= | Optional Y-cable | 12.2(28)SB and later releases of Cisco IOS Release 12.2(28)SB<br>For registered Cisco.com users, use Software Advisor to determine the software releases for this line card. |

The 4-port channelized T3 half-height line card provides the Cisco 10000 router with four DS3 ports of high-density T3 service. The 4-port channelized T3 half-height line card provides the following features:

- Supports full line rate transfers of packet sizes from 64 bytes to 8000 bytes
- Supports 256 serial data channels for the first three ports, and 255 serial data channels for the last port, or 1023 channels per half-height module
- The 256 (255) serial data channels per port are configurable up to:
  - 1 DS3 interface
  - 28 DS1 interfaces
  - 256 (255) N x DS0 interfaces

  Or any combination of these interfaces that does not exceed the bandwidth of the port

**Note** Port 3 supports only 255 channels.

- Provides high availability when two 4-port channelized T3 half-height line cards are installed and interconnected with a Y-cable in a redundant configuration

The 4-port channelized T3 half-height line card conforms to USA and international interface standards for DS3 operation. Among these are ANSI T1.107, ANSI T1.102, ANSI T1.404, ITU G.703, and ITU G.704.

If you are a registered Cisco.com user, see Feature Navigator for supported features.

# Software and Hardware Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether line cards within a system are compatible, but does provide the minimum Cisco IOS requirements for individual hardware line cards, modules, or options.

**Note** Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, click **Login** at Cisco.com, type “Software Advisor” in the SEARCH box, and click **Go**. Click the link for the Software Advisor tool.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

# Line Card, Router, and Processor Compatibility

Table 4-2 provides information about the router model, line card, and processor compatibility.

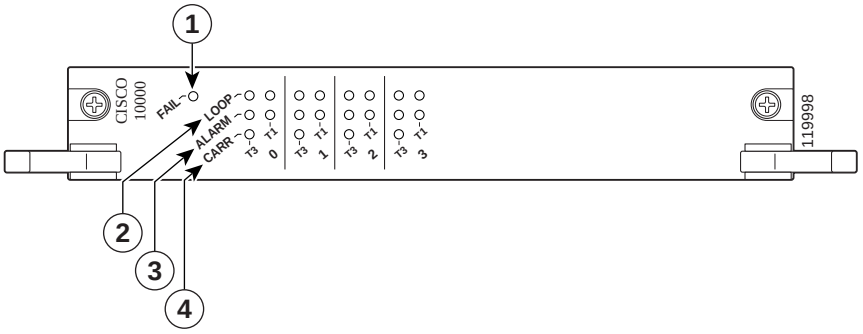
***Table 4-2 Line Card, Router, and Processor Compatibility***

| Line Card | Cisco 10008 | Cisco 10005 | PRE-2 | PRE-1 | PRE |
|---|---|---|---|---|---|
| 4-port channelized T3 half-height line card | Yes | No | Yes | No | No |

# LEDs

The 4-port channelized T3 half-height line card LEDs are described in Figure 4-1.

***Figure 4-1 4-Port Channelized T3 Half-Height Line Card Faceplate Description***




| | | | |
|---|---|---|---|
| **1** | FAIL LED | **3** | ALARM LED |
| **2** | LOOP LED | **4** | CARR (carrier detected) LED |

Table Table 4-3 provides a description of the 4-port channelized T3 half-height line card LEDs.

***Table 4-3 LED Description***

| LED Label | Color | State | Meaning |
|---|---|---|---|
| FAIL | Yellow | Off | Off when the line card is working properly. Turns on for a few seconds during line card power-on self test (POST), then turns off when the line card is working properly. |
| | | On | On when the line card POST fails. |
| LOOP | Yellow | Off | Off when the port is available for normal operation. |
| | | On: T3 Level | On when a loopback has been configured at the T3 level, and the port is not available for normal operation. |
| | | Blinking: T3 Level | In a redundant pair, the standby line card T3 level LOOP LED blinks. |
| | | On: T1 Level | On when a loopback has been configured for any one of the 28 T1s contained in the DS3 signal. |
| ALARM[1] | Yellow | Off | Off when the port is operating normally. |
| | | On: T3 Level | On when a T3 level alarm condition exists on the corresponding port. |
| | | On : T1 Level | On when an alarm condition exists on any one of the 28 T1s contained in the DS3 signal. |
| CARR (carrier detected) | Green | On | On when a carrier is detected at the corresponding port. |
| | | Off | Off when a loss of signal (LoS) is indicated. |

1. See the "Channelized Line Cards Troubleshooting Information" section on page 18-6 for alarm information.

# Physical Specifications

The 4-port channelized T3 half-height line card physical specifications are shown in Table 4-4.

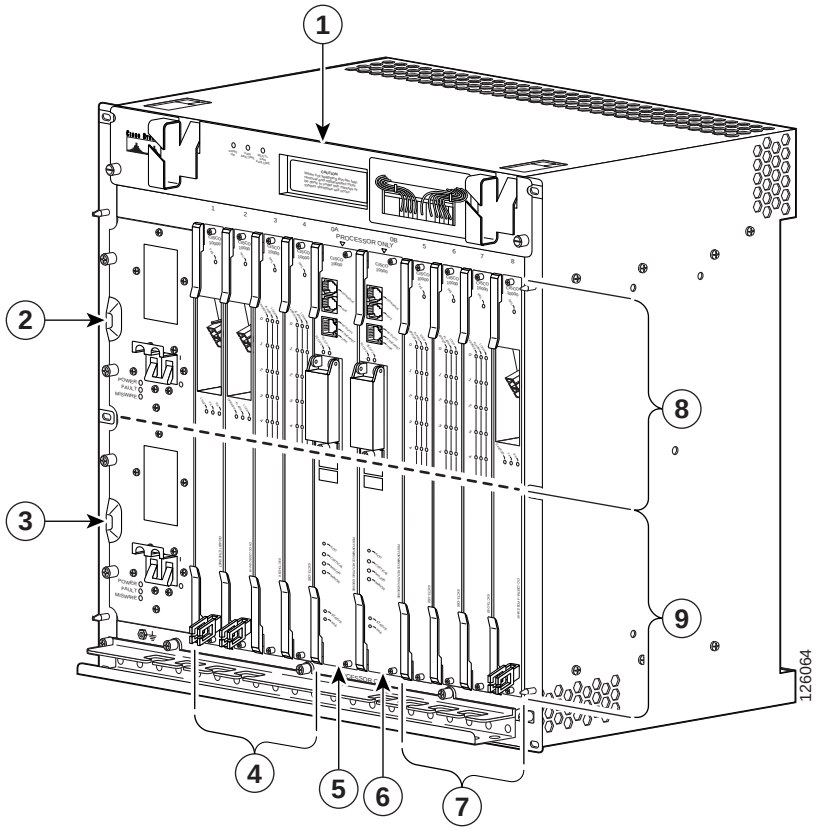
*Table 4-4 4-Port Channelized T3 Half-Height Line Card Physical Specifications*

| Description | Specifications |
|---|---|
| Physical dimensions | Height: 7.8 in. (19.8 cm)<br>Depth: 11 i.n (27.9 cm)<br>Width: 1.3 in. (3.3 cm) |
| Shipping weight | Approximately 2 lbs (0.9 kg) |
| Operating temperature | 41°F to 104°F (5°C to 40°C)<br>Short-term operating temperature is limited to 131°F (55°C) in compliance with Bellcore GR |
| Relative humidity | Operating—nominal: 5% to 85%<br>Operating—short term: 5% to 90%<br>Storage: 5% to 95% |
| Storage temperature | –40°F to 158°F (–40°C to 70C°) |

# Slot Locations

The line card slot designations are shown in Figure 4-2.

***Figure 4-2 Line Card Slot and Subslot Designations for the Cisco 10008 Router***




| | | | |
|---|---|---|---|
| **1** | Blower module | **6** | PRE slot 0B |
| **2** | Primary PEM | **7** | Line card slots 5 to 8 |
| **3** | Redundant PEM | **8** | Subslot 0 |
| **4** | Line card slots 1 to 4 | **9** | Subslot 1 |
| **5** | PRE slot 0A | | |

The 4-port channelized T3 half-height line card can be installed in subslot 0 or subslot 1 of line card slot 1 through slot 8. The Cisco 10000 carrier is used with the 4-port channelized T3 half-height line card.

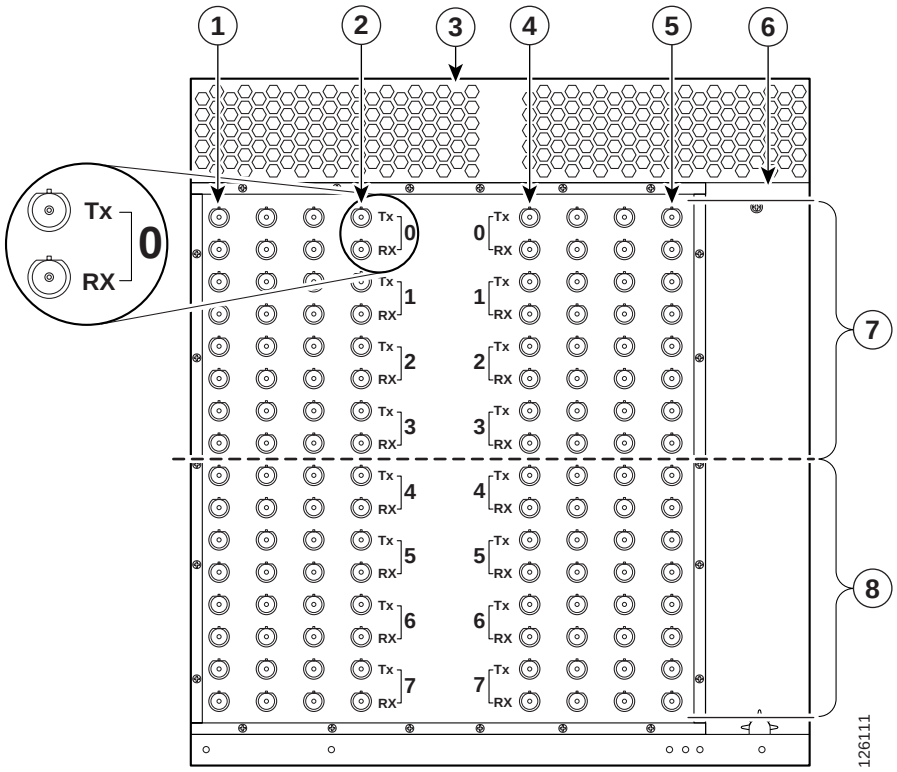
# Cables and Connectors

Figure 4-3 shows cable and connector information for the 4-port channelized T3 half-height line card.

## Cables

External network connections to the 4-port channelized T3 half-height line card are made through the BNC connectors mounted on the rear of the Cisco 10000 chassis, using 75-ohm coaxial cable. The approved cables for use with the 4-port channelized T3 half-height line card are cables conforming to WECO standards 728A, 734A, or 734D, for use with cable lengths up to 900 ft (274.32 m). 735A cables can be used with lengths up to 225 ft (68.58 m).

***Figure 4-3 Cisco 10000 Chassis Rear—BNC Connectors***




| | | | |
|---|---|---|---|
| **1** | Line card slot 8 | **5** | Line card slot 1 |
| **2** | Line card slot 5 | **6** | Power supply |
| **3** | Blower module | **7** | Half-height line card subslot 0 |
| **4** | Line card slot 4 | **8** | Half-height line card subslot 1 |

The BNC connectors on the rear of the chassis, which use coaxial cable, are used with the 4-port channelized T3 half-height line card.

**Caution** Do not install Y-cables unless you are using the Y-cable redundancy feature and have read all of these instructions.

**Caution** The Y-cables must be installed before configuring redundancy, and removed before deconfiguring redundancy.

- Eight BNC ports are arranged vertically per line card slot.
- Two BNC connectors, one TX and one RX, are used per port.
- Two 4-port channelized T3 half-height line cards can be placed in one slot, using the Carrier, with four BNC ports allocated for each 4-port channelized T3 half-height line card.
- When the 4-port channelized T3 half-height line card is in subslot 0 (the top subslot), the BNC connectors in use are ports 0 through 3.
- When the 4-port channelized T3 half-height line card is in subslot 1 (the bottom subslot), the BNC connectors in use are ports 4 through 7.

# Optional Y-Cables

**Caution** Read all of the information in this section before installing a Y-cable for redundancy.

Figure 4-4 shows the Y-cable. Figure 4-5 shows Y-cable connections. The product number for the optional Y-cable is CAB-BNC-71NY=.

***Figure 4-4 Optional Y-Cable***

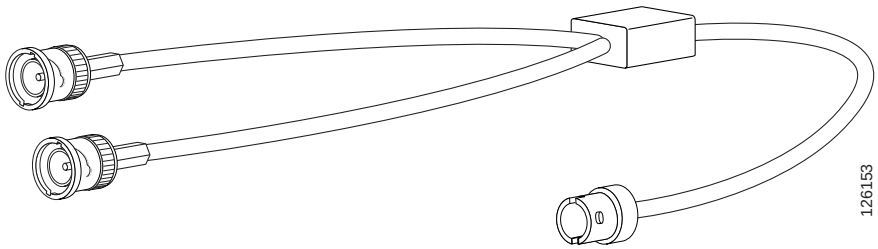
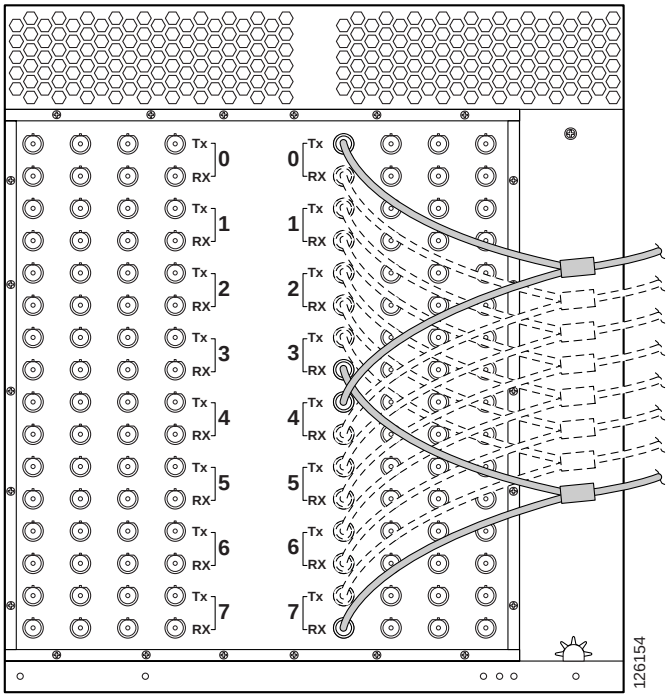


*Figure 4-5 Optional Y-Cable Connections*




The optional Y-cables can be used to provide one-to-one line card redundancy. For Y-cable redundant applications, see the "Configuration Summary" section on page 4-9, and configure the hardware as follows:

- Two 4-port channelized T3 half-height line cards must share the same slot.
- Eight Y-cables are required to configure a redundant pair of 4-port channelized T3 half-height line cards.
- The Y-cable has three BNC connectors. The two similar connectors must be connected to BNC connectors on the Cisco 10000 series router backplane corresponding to similar functions on each line card (for example, RX to RX), with the remaining connector being connected to the cable from the customer's network. See Figure 4-5. The following text explains how the Y-cable connects two 4-port channelized T3 half-height line cards. Additional Y-cables can be used as required.
  - The Y-cable connects the 4-port channelized T3 half-height line card in subslot 0, port 0 RX to the 4-port channelized T3 half-height line card in subslot 1, port 0 RX.
  - Another Y-cable would connect to the 4-port channelized T3 half-height line card in subslot 0, port 0 TX to the 4-port channelized T3 half-height line card in subslot 1, port 0 TX.
  - The remaining six Y-cables are connected in a similar fashion to form a completely redundant configuration.

## Configuration Summary

**Caution** The Y-cables must be installed before configuring redundancy, and removed before deconfiguring redundancy.

1. To configure redundancy, you must:
   a. Attach all Y-cables in this order: to the primary line card, to the secondary line card, and to the far end.
   b. Configure the primary line card.
   c. Configure the secondary line card.
2. To deconfigure redundancy:
   a. Use “red line switch from...” to make the secondary line card standby (if it is active) and the primary line card active if you want to deconfigure only the secondary line card (perhaps for servicing).
   b. Detach the Y-cable from all ports on the secondary line card.
   c. Deconfigure the secondary line card.
3. If you want to deconfigure all redundancy, you must:
   a. Remove all the Y-cables and the cable for nonredundancy if desired.
   b. Deconfigure the secondary line card and primary line card.

See the *Cisco 10000 Series Routers Line Card Configuration Guide* for information about configuring redundancy using the optional Y-cables.

Go to Chapter 16, “Preparing for Installation” to begin the installation or replacement of the line card.

For to rubles hooting information see Chapter 18, “Troubleshooting the Installation.”

# 24-Port Channelized E1/T1 Line Card Overview

This chapter describes the Cisco 10000 series 24-port channelized E1/T1 line card (referred to as the 24-port channelized E1/T1 line card), and contains the following sections:


- Line Card Summary, page 5-1
- Software and Hardware Compatibility, page 5-3
- Line Card, Router, and Processor Compatibility, page 5-4
- LEDs, page 5-4
- Physical Specifications, page 5-5
- Slot Locations, page 5-6
- Cables, Connectors, and Pinouts, page 5-7


## Line Card Summary

*Table 5-1 24-Port Channelized E1/T1 Line Card Summary*

| Product Number | Description | Minimum Cisco IOS Release |
|---|---|---|
| ESR-24CT1/E1= | 24-port channelized T1/E1 line card | Initial Cisco IOS release for PRE-1:<br>12.0(22)S and later releases of Cisco IOS Release 12.0S<br>Initial Cisco IOS release for PRE-2:<br>12.2(15)BX and later releases of 12.2BX<br>2.2(28)SB and later releases of Cisco IOS Release 12.2(28)SB<br>12.3(7)XI and later releases of Cisco IOS 12.3XI<br>For registered Cisco.com users, use Software Advisor to determine the software releases for this line card. |

The 24-port channelized E1/T1 line card provides Cisco 10000 routers with 24 copper channelized or unchannelized interface ports that you can configure as E1 or T1 interfaces. When you configure a line card for:

- E1 operation—You can configure each E1 port as one or more interfaces for framed (channelized) operation, or as a single channel for unframed (unchannelized) operation.
- T1 operation—You can configure each T1 port as one or more interfaces for framed operation.

# E1 Features

The E1 features of this line card support:

- European 2.048 MbpsTU G.703 and G.704 serial interfaces
- Local or network loopback for any E1 port. Network loopback supports:
  - Line
  - Payload
- CRC4 (cyclic redundancy check) and non-CRC4 framing modes
- Detection of LoS (loss of signal) and LoF (loss of frame)
- Protocol encapsulations:
  - High-Level Data Link Control (HDLC)
  - Frame relay
  - Point-to-Point Protocol (PPP)
- Channel bandwidths of N x 64 kbps in framed E1 mode, where N has a value from 1 to 31, and a single channel bandwidth of 2048 kbps (N = 32) in unframed E1 mode
- Per-port selection of internal or external (line) clock source
- Solutions for service providers where fiber interfaces are unavailable
- Internet service provider interface connections to existing copper Internet Protocol (IP) E1 lines
- Programmable National Reserved bits
- High density bipolar 3 (HDB3) line encoding
- E1-level bit error rate test (BERT) functions

# T1 Features

The T1 features of this line card support:

- Alternate Mark Inversion (AMI) or Bipolar with 8-Zeros Substitution (B8ZS) line encoding
- Up to 24 separate interfaces per T1 port
- FDL support:
  - Full ANSI T1.403 mode
  - ATT 54016 receive-only
  - SMARTJACK remote loopback
- Loopback for each T1 port
  - Line and payload (types of network loopback)
  - Local
  - Remote
- Per-port selection of internal or external (line) clock source
- Detection of LoS and LoF
- Short-haul line buildout up to 655 feet

- Super Frame (SF) or Extended Super Frame (ESF) framing modes
- Protocol encapsulations:
  - HDLC
  - Frame Relay
  - PPP
- Channel bandwidths of N x 64 kbps or N x 56 kbps in channelized T1 mode, where N has a value from 1 to 24
- Solutions for service providers where fiber interfaces are unavailable
- Internet service provider interface connections to existing copper Internet Protocol (IP) T1 channels
- T1-level bit error rate test (BERT) functions

If you are a registered Cisco.com user, see Feature Navigator for supported features.

# Software and Hardware Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether line cards within a system are compatible, but does provide the minimum Cisco IOS requirements for individual hardware line cards, modules, or options.

**Note** Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, click **Login** at Cisco.com, type **Software Advisor** in the search box, and click **Go**. Click the link for the Software Advisor tool.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

# Line Card, Router, and Processor Compatibility

Table 5-2 lists router model, line card, and processor compatibility.

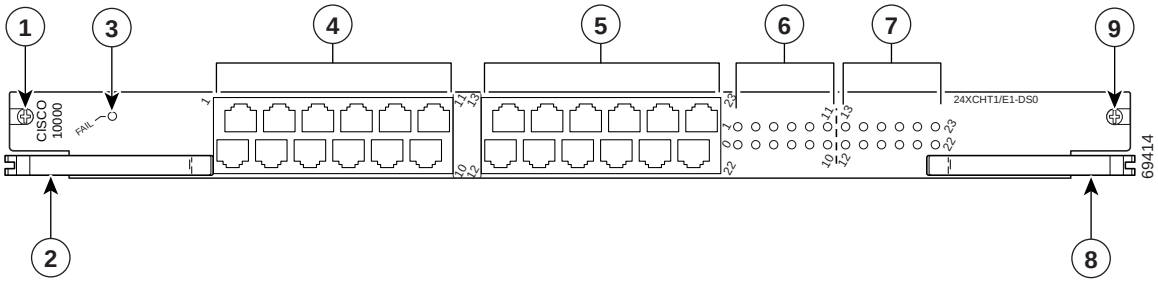
***Table 5-2 Line Card, Router, and Processor Compatibility***

| Line Card | Cisco 10008 | Cisco 10005 | PRE-2 | PRE-1 | PRE |
|---|---|---|---|---|---|
| 24-port channelized E1/T1 line card | Yes | Yes | Yes | Yes | No |

# LEDs

The 24-port channelized E1/T1 line card LEDs are shown in Figure 5-1.

***Figure 5-1 24-Port Channelized E1/T1 Line Card Faceplate Description***




| | | | |
|---|---|---|---|
| **1** | Top captive screw | **6** | Ports 0 to 11 status LEDs |
| **2** | Top ejector lever | **7** | Ports 12 to 23 status LEDs |
| **3** | FAIL LED | **8** | Bottom ejector lever |
| **4** | Ports 0 to 11 RJ-45 jacks | **9** | Bottom captive screw |
| **5** | Ports 12 to 23 RJ-45 jacks | | |

Table 5-3 provides a description of the 24-port channelized E1/T1 line card LEDs.

***Table 5-3 LED Description***

| LED Label | Color | State | Meaning |
|---|---|---|---|
| FAIL | Yellow | Off | Off during normal operation. This LED lights momentarily during power-on self test (POST) and then goes out on a properly working line card. |
| | | On | On if a line card fails during operation, and an alarm event occurs. |
| 0–23 (Status LEDs) | Green | On | Carrier Detect LED on indicates that a carrier signal exits at the corresponding port, which is normal interface operation. During loopback testing, this LED also lights green. |
| | | Off | When the LED is off, the port is administratively down. |
| | Yellow | Off | When this Alarm Active LED is not lit, the port is administratively down. |
| | | On | Alarm Active LED is on when the corresponding port data path is in an alarm condition. The following alarms are monitored: LoS (Loss of Signal), LoF (Loss of Frame), RAI (Remote Alarm Indication), and AIS (Alarm Indication Signal). |

# Physical Specifications

The 24-port channelized E1/T1 line card physical specifications are shown in Table 5-4.

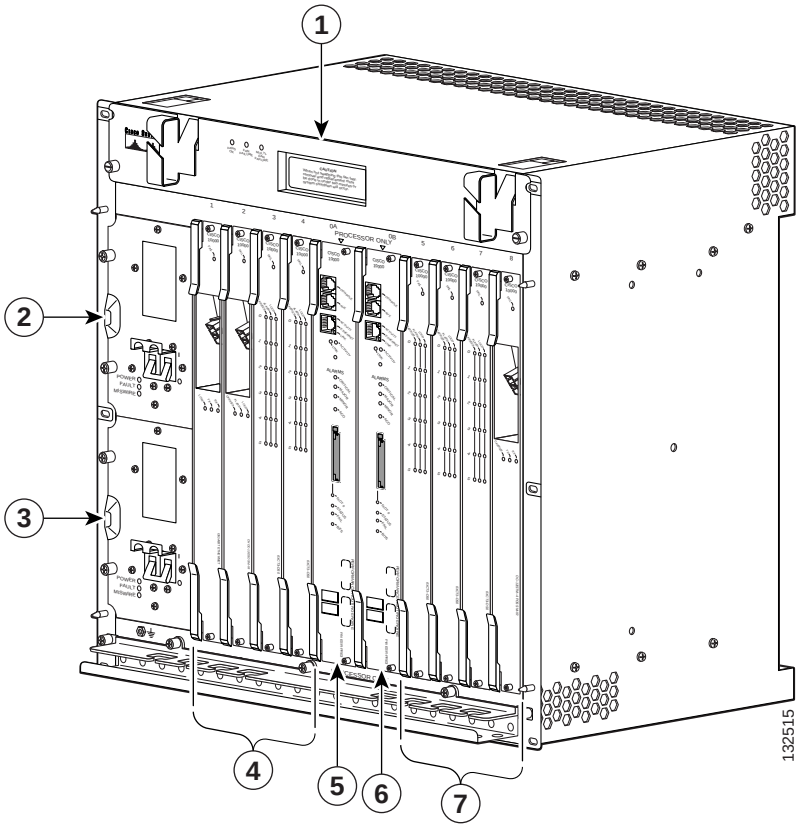
***Table 5-4 24-Port Channelized E1/T1 Line Card Physical Specifications***

| Description | Specifications |
|---|---|
| Physical dimensions | Height: 16.0 in. (40.64 cm)<br>Depth: 9.97 in. (25.32 cm)<br>Width: 1.12 in. (2.83 cm) |
| Shipping weight | Approximately 4.75 lb (2.16 kg) |
| Operating temperature | 41°F to 104°F (5°C to 40°C)<br>Short-term operating temperature is limited to 131°F (55°C) in compliance with Bellcore GR |
| Relative humidity | Operating—nominal: 5% to 85%<br>Operating—short term: 5% to 90%<br>Storage: 5% to 95% |
| Storage temperature | –40°F to 158°F (–40°C to 70C °) |

# Slot Locations

The line card slot designations are shown in this section. See Figure 5-2 for line card slot designations for the Cisco 10008 router and Figure 5-3 for line card slot designations for the Cisco 10005 router.

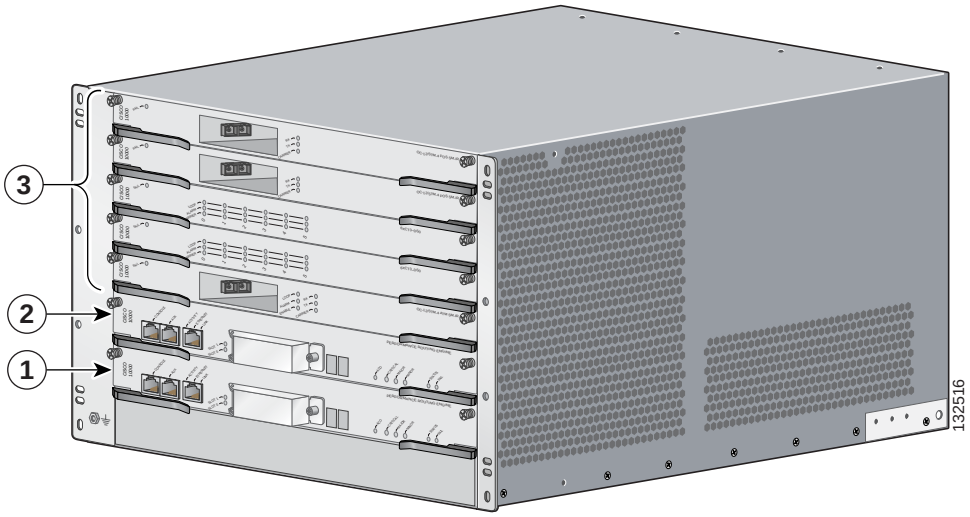
***Figure 5-2 Line Card Slot Designations for the Cisco 10008 Router***




| | | | |
|---|---|---|---|
| **1** | Blower module | **5** | PRE slot 0A |
| **2** | Primary PEM | **6** | PRE slot 0B |
| **3** | Redundant PEM | **7** | Line card slots 5 to 8 |
| **4** | Line card slots 1 to 4 | | |

The 24-port channelized E1/T1 line card can be installed in line card slot 1 through slot 8.

*Figure 5-3 Line Card Slot Designations for the Cisco 10005 Router*




| | | | |
|---|---|---|---|
| **1** | PRE slot A | **3** | Line card slots 1 (top) to 5 (bottom) |
| **2** | PRE slot B | | |

The 24-port channelized E1/T1 line card can be installed in line card slot 1 through slot 5.

# Cables, Connectors, and Pinouts

You can use up to 24 Category 3 or Category 5 unshielded twisted pair (UTP) transmit and receive cables with RJ-45 connectors at each end. These cables connect to two staggered 12-line faceplate RJ-45 jacks with 110-ohm balanced-line inputs, which allow the line card to operate in either T1 (100 ohm balanced) or E1 (120 ohm balanced) mode. The faceplate RJ-45 jacks are numbered 0 to 11 and 12 to 23 left-to-right and top-to-bottom.

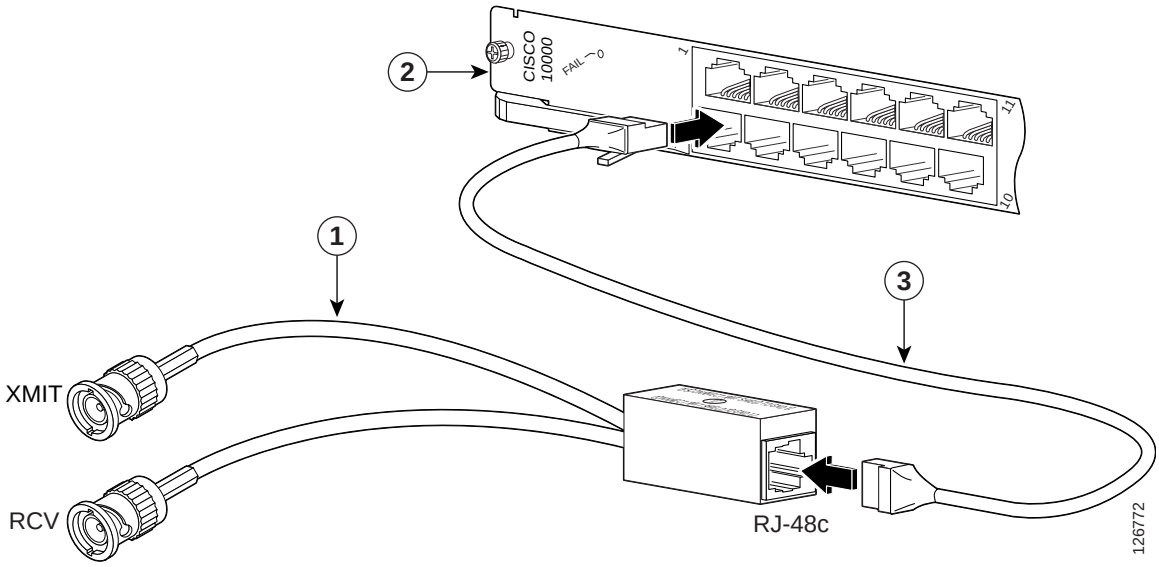
You can also use a Cisco cable adapter (CAB-ADAPT-75-120=) for coaxial British Navel Connector (BNC) unbalanced transmit and receive E1 connections (see the "Using the BNC Cable Adapter" section on page 5-8).

**Caution** If the Cisco 10000 series router is used in an environment in which lightning-induced transients are likely to couple to the signal lines, use of shielded interconnection cables for the E1/T1 ports is highly recommended. In addition, use of shielded interconnection cables for the E1/T1 ports is required to meet Telcordia (formerly Bellcore) GR1089 CORE Section 4.5.9 and ETSI Section 5.2.2.2 (intrabuilding lightning surge).

# Using the BNC Cable Adapter

Figure 5-4 shows the adapter cable available for the 24-port channelized E1/T1 line card.

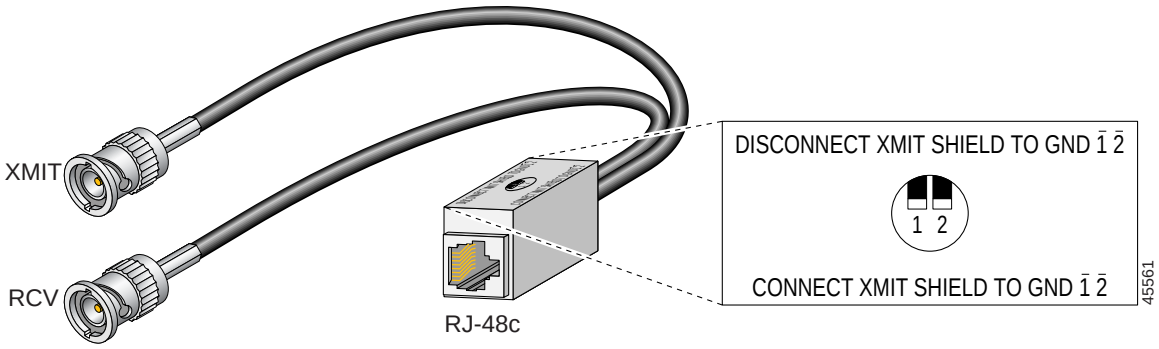
***Figure 5-4 Faceplate, Connecting Cable, and Adapter Cable***




| | | | |
|---|---|---|---|
| **1** | Adapter cable | **3** | Connecting cable (RJ-45 STP, male/male) |
| **2** | RJ-45 ports on faceplate | | |

An RJ-45 STP cable with two male RJ-45 connectors is required to connect the adapter cable and RJ-45 ports on the face of the line card (Figure 5-5).

***Figure 5-5 75–120 Ohm Adapter Cable***




Cisco cable adapters (CAB-ADAPT-75-120=) connect 75-ohm unbalanced G.703 E1 coaxial BNC transmit and receive lines to Cisco E1 120-ohm balanced transmit and receive lines.

The connections are made through eight-pin RJ-45 jacks on the 120-ohm side of the adapter cable and dual coaxial lines (transmit and receive) with BNC connectors at the 75-ohm side.

Class A emissions compliance is met when the 120-ohm E1 port is connected to the 75-120-ohm cable adapter using RJ-45 connectors and Category 3 or Category 5 shielded foil twisted-pair (FTP) cable with 120-ohm impedance. Two switches on the 120-ohm side must be configured to connect the outer conductor of the shielded cable to a protected earth ground (see enlargement in Figure 5-5).

# Pinouts

Table 5-5 lists pinouts for the RJ-45 connector.

***Table 5-5 RJ-45 Port Pinouts***

| Pin | RJ-45 |
|---|---|
| 1 | RX tip |
| 2 | RX ring |
| 3 | No connection |
| 4 | TX tip |
| 5 | TX ring |
| 6 | No connection |
| 7 | No connection |
| 8 | No connection |

Go to Chapter 16, “Preparing for Installation” to begin the installation or replacement of the line card.

For troubleshooting information, see Chapter 18, “Troubleshooting the Installation.”

# 1-Port Channelized OC-12/STM-4 Line Card Overview

This chapter describes the Cisco 10000 series 1-port channelized OC-12/ STM-4 line card (referred to as the 1-port channelized OC-12/STM-4 line card) and contains the following sections:


- Line Card Summary, page 6-2
- Software and Hardware Compatibility, page 6-3
- Line Card, Router, and Processor Compatibility, page 6-3
- LEDs, page 6-3
- Physical Specifications, page 6-4
- Slot Locations, page 6-5
- Cables and Connectors, page 6-7

# Line Card Summary

*Table 6-1 1-Port Channelized OC-12/STM-4 Line Card Summary*

| Product Number | Description | Minimum Cisco IOS Release |
|---|---|---|
| ESR-1COC-12/STM-4-SMI= | 1-port channelized OC-12/STM-4 (DS0/DS1/E1/DS3) line card | Initial Cisco IOS releases for PRE-1:<br>12.0(9)SL and later releases of 12.0SL<br>12.0(17)ST and later releases of 12.0ST<br>12.0(22)S and later releases of Cisco IOS Release 12.0S<br>12.2(8)BZ and later releases of Cisco IOS Release 12.2(8)BZ for SONET mode only.<br>For both SONET and SDH mode, use Cisco IOS Release 12.0(23)S and later releases of Cisco IOS 12.0S.<br>Initial Cisco IOS releases for PRE-2:<br>12.2(28)SB and later releases of Cisco IOS Release 12.2(28)SB<br>12.3(7)XI and later releases of Cisco IOS 12.3XI<br>For both SONET and SDH mode, use Cisco IOS Release 12.2(15)BX and later releases of Cisco IOS 12.2BX<br>Initial Cisco IOS releases for PRE-3:<br>12.2(31)SB2 and later releases of Cisco IOS Release 12.2SB<br>For registered Cisco.com users, use Software Advisor to determine the software releases for this line card. |

The 1-port channelized OC-12/STM-4 line card uses fractional T1 (n x DS0), DS-1, E1, fractional E1 (n x DS0) and DS3 IP services to connect ISP customers to the network backbone. It provides full duplex operation at OC-12 bandwidth rates using a (single-mode) fiber optic port that provides the Cisco 10000 series router with a single interface that connects up to 768 individual channelized options.

The 1-port channelized OC-12/STM-4 line card has one single-mode, intermediate-reach SC OC-12/STM-4 duplex optical connector.

The line card can be configured into either SONET or SDH mode.

- When configured for SONET mode, the OC-12 port carries twelve DS3 (full rate, subrate, or channalized down to DS1) channels, or 336 individual DS1, each capable of carrying one channel at full or fractional rates.
- When configured for SDH mode, the STM-4 port carries twelve DS3 (full rate, subrate, or channalized) channels, 336 individual DS1s, or 252 individual E1s; each DS1/E1 is capable of carrying a single channel at full or fractional rates. The line card runs in either E1 or T1 mode, but no mixture of T1/E1 is supported.

The line card supports up to 768 channels. The total number of channels cannot exceed the chassis scaling limits.

If you are a registered Cisco.com user, see Feature Navigator for supported features.

# Software and Hardware Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether line cards within a system are compatible, but does provide the minimum Cisco IOS requirements for individual hardware line cards, modules, or options.

**Note** Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, click **Login** at Cisco.com, type “Software Advisor” in the SEARCH box, and click **Go**. Click the link for the Software Advisor tool.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

# Line Card, Router, and Processor Compatibility

Table 6-2 lists the router model, line card, and processor compatibility.

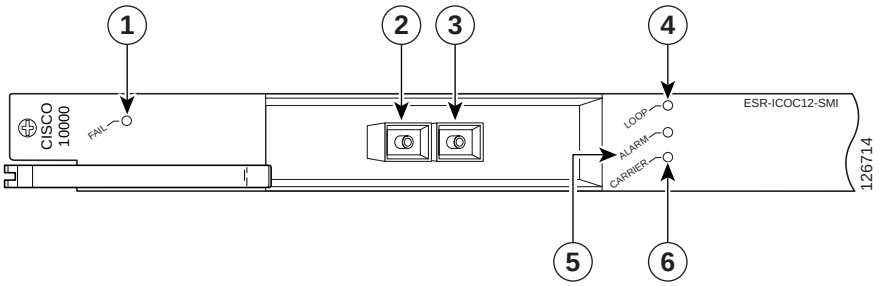
***Table 6-2 Line Card, Router, and Processor Compatibility***

| Line Card | Cisco 10008 | Cisco 10005 | PRE-3 | PRE-2 | PRE-1 | PRE |
|---|---|---|---|---|---|---|
| 1-port channelized OC-12/ STM-4 Line Card | Yes | Yes | Yes | Yes | Yes | Yes |

# LEDs

The 1-port channelized OC-12/ STM-4 line card LEDs are shown in Figure 6-1.

***Figure 6-1 1-Port Channelized OC-12/STM-4 Faceplate Description***




| | | | |
|---|---|---|---|
| **1** | Fail LED | **4** | Loop LED |
| **2** | TX | **5** | Alarm LED |
| **3** | RX | **6** | Carrier LED |

Table 6-3 provides a description of the 1-port channelized OC-12/ STM-4 line card LEDs.

***Table 6-3 LED Description***

| LED Label | Color | State | Meaning |
|---|---|---|---|
| FAIL | Yellow | Off | On when the line card power on self test (POST) fails. |
| | | On | A major failure has disabled the line card. |
| LOOP | Yellow | Off | Port is not in a loopback state. |
| | | On | On when the port is in a loopback state and is not enabled for data traffic. |
| ALARM | Yellow | Off | No alarm condition. |
| | | On | On when an alarm condition exists at OC-12, E-1, DS3, or DS1 level. |
| CARRIER (carrier detected) | Green | Off | No carrier is detected; the port is not able to pass traffic. |
| | | On | On when a carrier is detected at the corresponding port. |

# Physical Specifications

The 1-port channelized OC-12/ STM-4 line card physical specifications are shown in Table 6-4.

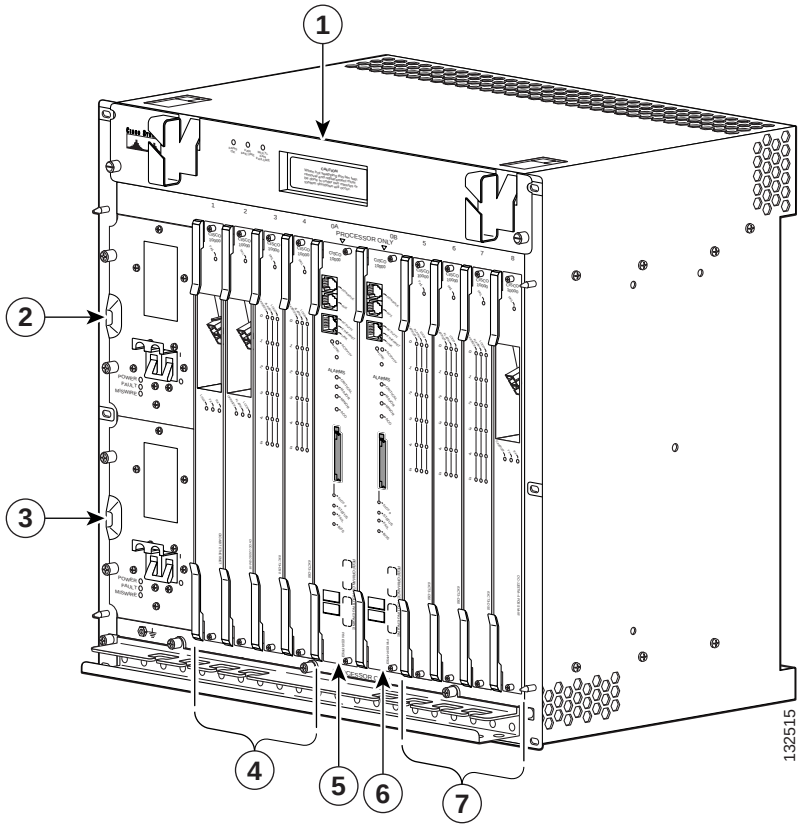
***Table 6-4 1- Port Channelized OC-12/STM-4 Line Card Physical Specifications***

| Description | Specifications |
|---|---|
| Physical dimensions | Height: 16.0 in. (40.64 cm)<br>Depth: 9.97 in. (25.32 cm)<br>Width: 1.12 in. (2.83 cm) |
| Shipping weight | Approximately 4.75 lb (2.16 kg) |
| Operating temperature | 41°F to 104°F (5°C to 40°C)<br>Short-term operating temperature is limited to 131°F (55°C) in compliance with Bellcore GR |
| Relative humidity | Operating—nominal: 5% to 85%<br>Operating—short term: 5% to 90%<br>Storage: 5% to 95% |
| Storage temperature | –40°F to 158°F (–40°C to 70C °) |

# Slot Locations

The line card slot designations are shown in this section. See Figure 6-2 for line card slot designations for the Cisco 10008 router and Figure 6-3 for line card slot designations for the Cisco 10005 router.

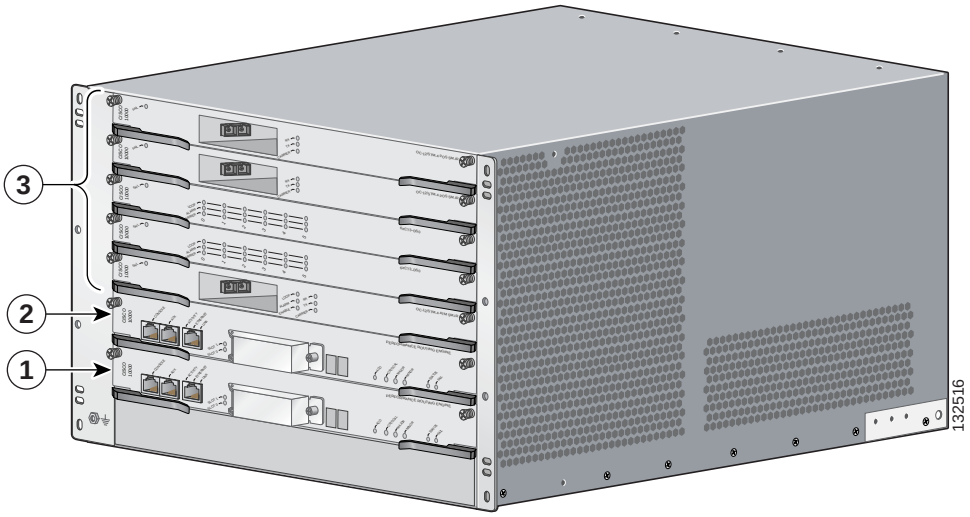
***Figure 6-2 Line Card Slot Designations for the Cisco 10008 Router***




| | | | |
|---|---|---|---|
| **1** | Blower module | **5** | PRE slot 0A |
| **2** | Primary PEM | **6** | PRE slot 0B |
| **3** | Redundant PEM | **7** | Line card slots 5 to 8 |
| **4** | Line card slots 1 to 4 | | |

The 1-port channelized OC-12/ STM-4 line card can be installed in line card slot 1 through slot 8.

*Figure 6-3 Line Card Slot Designations for the Cisco 10005 Router*




| | | | |
|---|---|---|---|
| **1** | PRE slot A | **3** | Line card slots 1 (top) to 5 (bottom) |
| **2** | PRE slot B | | |

The 1-port channelized OC-12/ STM-4 line card can be installed in line card slot 1 through slot 5.

# Cables and Connectors

The 1-port channelized OC-12/STM-4 line card uses an SC-type optical connector.

Table 6-5 and Table 6-6 provide optical cabling specifications for the line card.

*Table 6-5 Optical Specifications*

| Transceiver Type | Transmit Power | Maximum Power to Receiver | Minimum Receiver Sensitivity | Nominal Distance Between Stations | Wavelength | Fiber Type |
|---|---|---|---|---|---|---|
| Single-mode intermediate reach | –15 dBm minimum to –8 dBm maximum | –8 dBm | –28 dBm | Up to 9 mi (15 km) | 1280 nm to 1335 nm | Single mode, core size 8 to 10 microns |

*Table 6-6 Optical Power Budget*

| Power Budget | Transmit Power | Receive Power | Typical Maximum Distance |
|---|---|---|---|
| 12 dB | –15 dBm to –8 dBm | –28 dBm to –8 dBm | 9.3 miles (15 km) |

Go to Chapter 16, “Preparing for Installation” to begin the installation or replacement of the line card.

For troubleshooting information, see Chapter 18, “Troubleshooting the Installation.”

# 4-Port Channelized OC-3/STM-1 Line Card Overview

This chapter describes the Cisco 10000 series 4-port channelized OC-3/STM-1 line card (referred to as the 4-port channelized OC-3/STM-1 line card) and contains the following sections:


- Line Card Summary, page 7-2
- Software and Hardware Compatibility, page 7-3
- Line Card, Router, and Processor Compatibility, page 7-3
- LEDs, page 7-3
- Physical Specifications, page 7-5
- Slot Locations, page 7-6
- Cables and Connectors, page 7-8

# Line Card Summary

*Table 7-1 4-Port Channelized OC-3/STM-1 Line Card Summary*

| Product Number | Description | Minimum Cisco IOS Release |
|---|---|---|
| ESR-4OC3-ChSTM-1/OC-3= | Cisco 10000 series 4-port channelized OC-3/STM-1 (DS3/E1/DS1/DS0) SDH line card | Initial Cisco IOS releases for PRE-1:<br>12.0(15)SL and later releases of 12.0SL<br>12.0(17)ST and later releases of Cisco IOS 12.0ST<br>12.0(22)S and later releases of Cisco IOS 12.0S<br>12.2(8)BZ and later releases of Cisco IOS 12.2BZ for SDH mode.<br><br>For both SONET and SDH mode, use Cisco IOS Release 12.0(23)S and later releases of Cisco IOS 12.0S.<br><br>Initial Cisco IOS Releases for PRE-2:<br>12.3(7)XI and later releases of Cisco IOS 12.3XI<br><br>For both SONET and SDH mode, the use Cisco IOS Release 12.2(15)BX and later releases of Cisco IOS 12.2BX.<br><br>Cisco IOS Release 12.2(28)SB and later releases of Cisco IOS Release 12.2(28)SB<br><br>For registered Cisco.com users, use Software Advisor to determine the software releases for this line card. |

The 4-port channelized OC-3/STM-1 line card uses fractional T1 (n x DS0), DS-1, E1, fractional E1 (n x DS0) and DS3 IP services to connect ISP customers to the network backbone. It provides full duplex operation at OC-3 bandwidth rates using a (single-mode) fiber optic port that provides the Cisco 10000 series router with one interface that connects up to 768 individual channelized options.

The 4-port channelized OC-3/STM-1 line card has four single-mode, intermediate-reach LC OC-3/STM-1 duplex optical connectors.

The line card can be configured into either SONET or SDH mode.

- When configured for SONET mode, each OC-3 port carries three DS3 (full rate, subrate, or channelized down to DS1) channels, or 84 individual DS1s, each capable of carrying a single channel at full or fractional rates.
- When configured for SDH mode, each STM-1 port carries three DS3 (full rate, subrate, or channelized) channels, 84 individual DS1s, or 63 individual E1s; each DS1/E1 is capable of carrying a single channel at full or fractional rates. The line card runs in either E1 or T1 mode, but no mixture of T1/E1 is supported.

Each STM-1 port supports up to 192 channels, for a total of 768 channels per line card. The total number of channels cannot exceed the chassis scaling limits.

If you are a registered Cisco.com user, see Feature Navigator for supported features.

# Software and Hardware Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether line cards within a system are compatible, but does provide the minimum Cisco IOS requirements for individual hardware line cards, modules, or options.

**Note** Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, click **Login** at Cisco.com, type **Software Advisor** in the SEARCH box, and click **Go**. Click the link for the Software Advisor tool.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

# Line Card, Router, and Processor Compatibility

Table 7-2 shows the router model, line card, and processor compatibility.

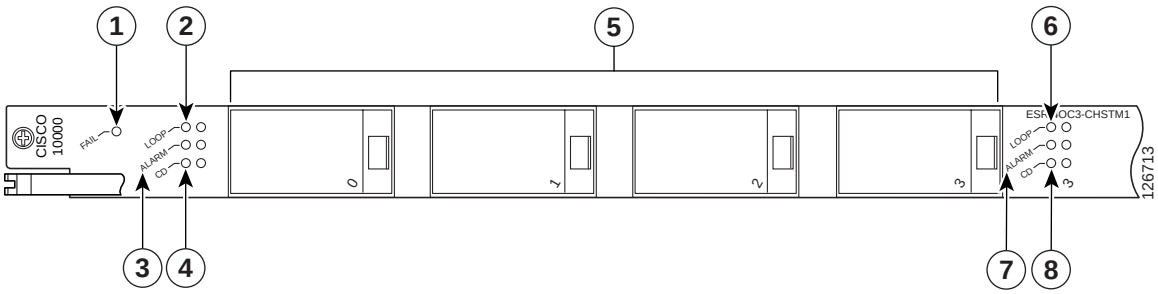
***Table 7-2 Line Card, Router, and Processor Compatibility***

| Line Card | Cisco 10008 | Cisco 10005 | PRE-2 | PRE-1 | PRE |
|---|---|---|---|---|---|
| 4-port channelized OC-3/STM-1 line card | Yes | Yes | Yes | Yes | Yes |

# LEDs

The 4-port channelized OC-3/STM-1 line card LEDs are shown in Figure 7-1.

***Figure 7-1 4-Port Channelized OC-3/STM-1 Line Card Faceplate Description***




| | | | |
|---|---|---|---|
| **1** | Fail LED | **5** | Ports 0–3<br>(TX in this illustration is to the left and RX to the right for each port. When inserted, TX is on top, RX on the bottom.) |
| **2** | Loop LED (ports 0 and 1) | **6** | Loop LED (ports 2 and 3) |
| **3** | Alarm LED (ports 0 and 1) | **7** | Alarm LED (ports 2 and 3) |
| **4** | CD (carrier detect) LED (ports 0 and 1) | **8** | CD (carrier detect) LED (ports 2 and 3) |

Table 7-3 provides a description of the 4-port channelized OC-3/STM-1 line card LEDs.

***Table 7-3 LEDs Description***

| LED Label | Color | State | Meaning |
|---|---|---|---|
| FAIL | Yellow | Off | Off when line card is working properly. Turns on for a few seconds during line card power-on self test (POST), then turns off when the line card is working properly. |
| | | On | On when the line card POST fails. |
| LOOP | Green | Off | Off when the line card is available for normal operation. |
| | | On | On when one or more DS1/E1, DS3, or SONET subports on this port are looped back and cannot carry data traffic. Use the **no loopback** command to disable the loop. |
| ALARM | Green | Off | Off when the line card is operating normally. |
| | | On | On when an alarm condition exists at the corresponding port. Use the **show facility-alarm status** command to display more information about the alarm condition. |
| CD (carrier detected) | Green | Off | No carrier is detected—this port is not able to pass traffic. |
| | | On | On when a carrier is detected at the corresponding port and the port is properly configured to pass traffic. |

# Physical Specifications

The 4-port channelized OC-3/STM-1 line card physical specifications are shown in Table 7-4.

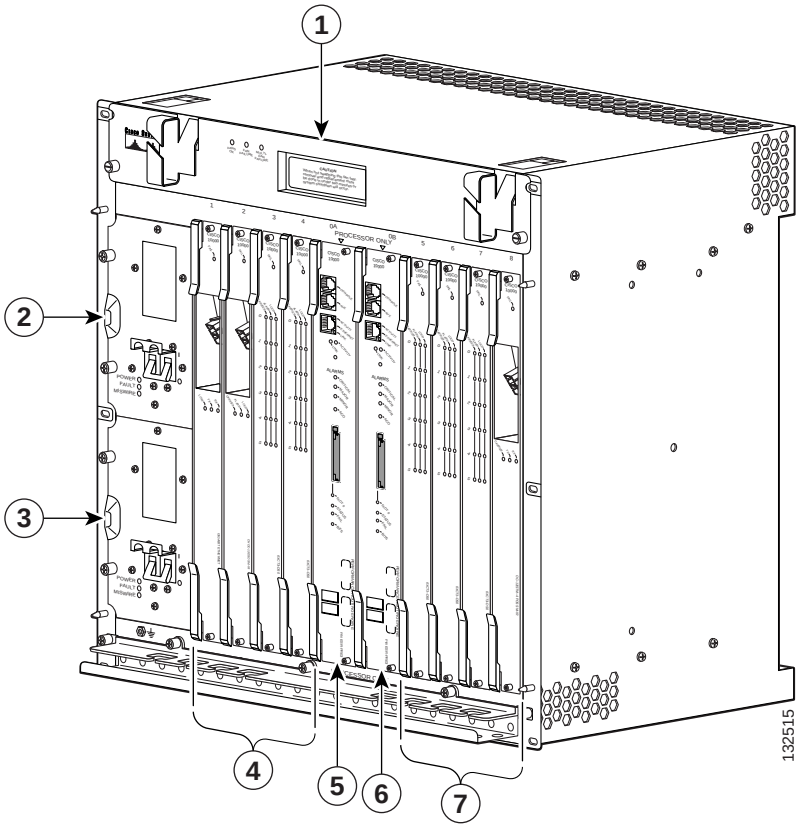
***Table 7-4 4-Port Channelized OC-3/STM-1 Line Card Specifications***

| Description | Specifications |
|---|---|
| Physical dimensions | Height: 16.0 in. (40.64 cm)<br>Depth: 9.97 in. (25.32 cm)<br>Width: 1.12 in. (2.83 cm) |
| Shipping weight | Approximately 4.75 lb (2.16 kg) |
| Operating temperature | 41°F to 104°F (5°C to 40°C)<br>Short-term operating temperature is limited to 131°F (55°C) in compliance with Bellcore GR |
| Relative humidity | Operating—nominal: 5% to 85%<br>Operating—short term: 5% to 90%<br>Storage: 5% to 95% |
| Storage temperature | –40°F to 158°F (–40°C to 70C °) |

# Slot Locations

The line card slot designations are shown in this section. See Figure 7-2 for line card slot designations for the Cisco 10008 router and Figure 7-3 for line card slot designations for the Cisco 10005 router.

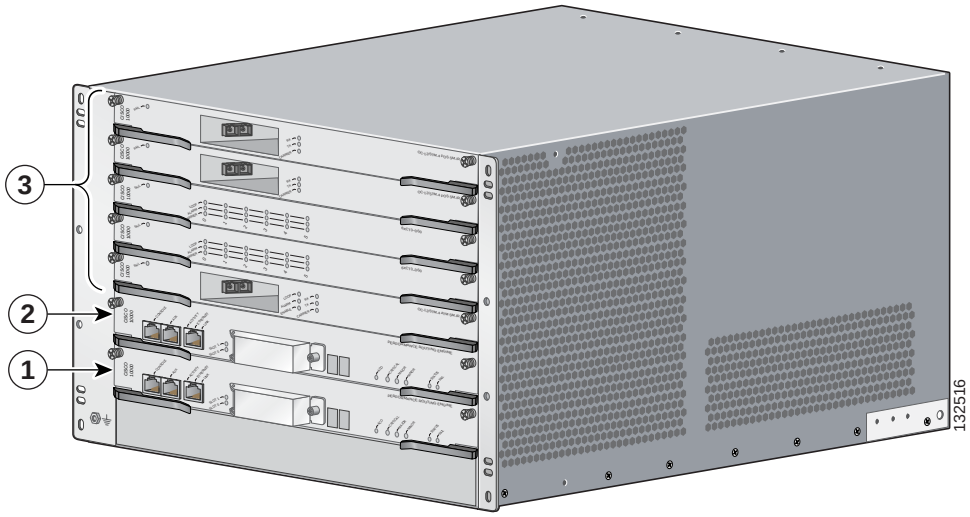
***Figure 7-2 Line Card Slot Designations for the Cisco 10008 Router***




| | | | |
|---|---|---|---|
| **1** | Blower module | **5** | PRE slot 0A |
| **2** | Primary PEM | **6** | PRE slot 0B |
| **3** | Redundant PEM | **7** | Line card slots 5 to 8 |
| **4** | Line card slots 1 to 4 | | |

The 4-port channelized OC-3/STM-1 line card can be installed in line card slot 1 through slot 8.

*Figure 7-3 Line Card Slot Designations for the Cisco 10005 Router*




| | | | |
|---|---|---|---|
| **1** | PRE slot A | **3** | Line card slots 1 (top) to 5 (bottom) |
| **2** | PRE slot B | | |

The 4-port channelized OC-3/STM-1 line card can be installed in line card slot 1 through slot 5.

# Cables and Connectors

The 4-port channelized OC-3/STM-1 line card uses an LC-type optical connector.

Table 7-5 and Table 7-6 provide optical cabling specifications for the line card.

***Table 7-5 Optical Specifications***

| Transceiver Type | Transmit Power | Maximum Power to Receiver | Minimum Receiver Sensitivity | Nominal Distance Between Stations | Wave-length | Fiber Type |
|---|---|---|---|---|---|---|
| Single-mode intermediate reach | -15 dBm minimum to -8 dBm maximum | –8dBm | –28 dBm | Up to 9 mi (15 km) | 1280 nm to 1335 nm | Single mode, core size 8 to 10 microns |

***Table 7-6 Optical Power Budget***

| Power Budget | Transmit Power | Receive Power | Typical Maximum Distance |
|---|---|---|---|
| 12 dB | –15 dBm to –8 dBm | –28 dBm to –8 dBm | 9.3 miles (15 km) |

Go to Chapter 16, “Preparing for Installation” to begin the installation or replacement of the line card.

For troubleshooting information, see Chapter 18, “Troubleshooting the Installation.”

# 6-Port Channelized T3 Line Card Overview

This chapter describes the Cisco 10000 series 6-port channelized T3 line card (referred to as the 6-port channelized T3 line card), and contains the following sections:


- Line Card Summary, page 8-1
- Software and Hardware Compatibility, page 8-2
- Line Card, Router, and Processor Compatibility, page 8-2
- LEDs, page 8-3
- Physical Specifications, page 8-4
- Slot Locations, page 8-5
- Cables and Connectors, page 8-6


## Line Card Summary

*Table 8-1 6-Port Channelized T3 Line Card Summary*

| Product Number | Description | Minimum Cisco IOS Release |
|---|---|---|
| ESR-6CT3= | 6-port channelized T3 line card | Initial Cisco IOS releases for PRE-1:<br>12.0(9)SL and later releases of Cisco IOS 12.0SL<br>12.0(17)ST and later releases of Cisco IOS 12.0ST<br>12.0(22)S and later releases of Cisco IOS 12.0S<br>12.2(8)BZ and later releases of Cisco IOS 12.2BZ<br><br>Initial Cisco IOS releases for PRE-2:<br>12.2(15)BX and later releases of Cisco IOS 12.2BX<br>12.2(28)SB and later releases of Cisco IOS Release 12.2(28)SB<br>12.3(7)XI and later releases of Cisco IOS 12. XI<br><br>For registered Cisco.com users, use Software Advisor to determine the software releases for this line card. |

The 6-port channelized T3 line card provides the Cisco 10000 series routers with six DS3 ports of high-density T3 service.

The Cisco 10008 router can support up to seven channelized T3 line cards, with a maximum capacity of 42 T3 connections or 1176 T1 connections per chassis. A fully loaded 7-foot rack can support up to 126 T3 connections, or 3528 T1 connections. This configuration assumes at least one slot is used for an uplink.

- You can channelize the T3 line into 28 independent DS1 data channels. You can channelize DS1 channels down to DS0 time slots (56 kbps or 64 kbps) with a maximum of 128 channels per DS3.
- Alternatively, the T3 line may supply some or all of the T3 payload (full-rate DS3) to a single end user.

If you are a registered Cisco.com user, see Feature Navigator for supported features.

# Software and Hardware Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether line cards within a system are compatible, but does provide the minimum Cisco IOS requirements for individual hardware line cards, modules, or options.

**Note** Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, click **Login** at Cisco.com, type “Software Advisor” in the SEARCH box, and click **GO.** Click the link for the Software Advisor tool.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

# Line Card, Router, and Processor Compatibility

Table 8-2 lists router model, line card, and processor compatibility.

***Table 8-2 Line Card, Router, and Processor Compatibility***

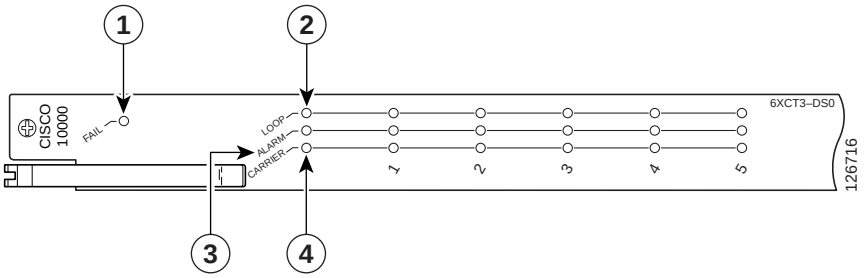
| Line Card | Cisco 10008 | Cisco 10005 | PRE-2 | PRE-1 | PRE |
|---|---|---|---|---|---|
| 6-port channelized T3 line card | Yes | Yes | Yes | Yes | Yes |

**Note** If you are using the 6-port channelized T3 line card with a Cisco 10005 router, you must use the Cisco 10005 extender card. See Appendix A, “Cisco 10005 Extender Card Information” for more information on the extender card.

# LEDs

The 6-port channelized T3 line card LEDs are Figure 8-1.

***Figure 8-1 6-Port Channelized T3 Line Card Faceplate Description***




| | | | |
|---|---|---|---|
| **1** | Fail LED | **3** | Alarm LED |
| **2** | Loop LED | **4** | Carrier (carrier detect) LED |

Table 8-3 provides a description of the 6-port channelized T3 line card LEDs.

***Table 8-3 LEDs Description***

| LED Label | Color | State | Meaning |
|---|---|---|---|
| FAIL | Yellow | Off | Off when line card is working properly. |
| | | On | A major failure has disabled the line card. |
| LOOP | Yellow | Off | Port is in a loopback state and not enabled for data traffic. |
| | | On | On when some portion of the corresponding port data is in a loopback state (T3 or T1) and is not enabled for data traffic. |
| ALARM | Yellow | Off | Off when there is no alarm condition. |
| | | On | On when an alarm condition (T3 or T1) exists at DS1, AIS, DS1 remote, DS1 OOF, DSE OOF, DSE AIS, or DS3 FERF 1 level. |
| CARRIER (carrier detected) | Green | Off | No carrier is detected; the port is not able to pass traffic. |
| | | On | On when a carrier is detected; the port is able to pass traffic. |

# Physical Specifications

The 6-port channelized T3 line card physical specifications appear in Table 8-4.

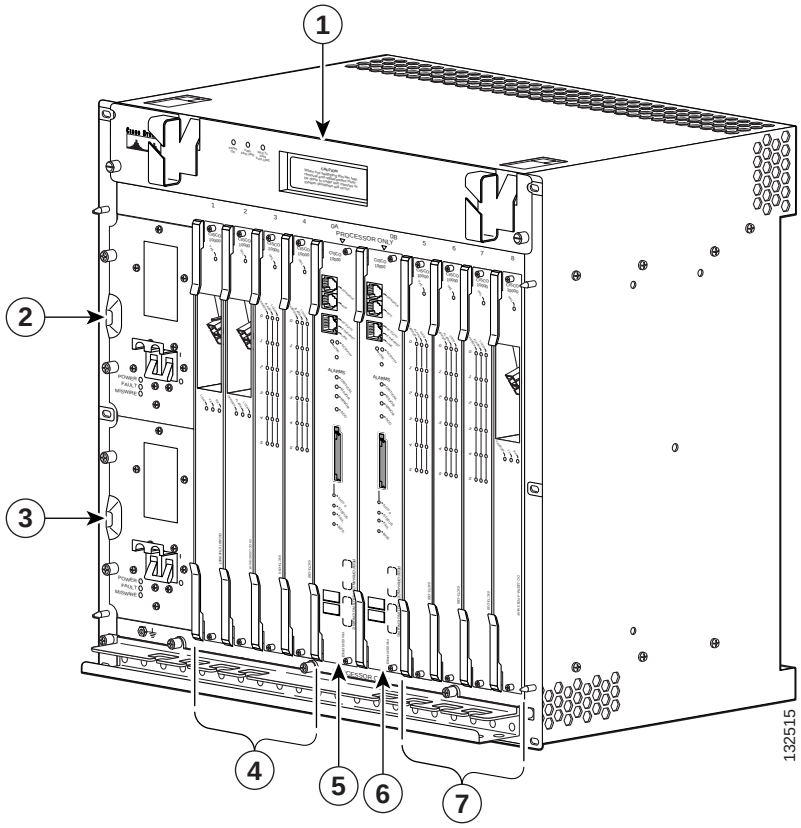
*Table 8-4 6-Port Channelized T3 Line Card Physical Specifications*

| Description | Specifications |
|---|---|
| Physical dimensions | Height: 16.0 in. (40.64 cm)<br>Depth: 9.97 in. (25.32 cm)<br>Width: 1.12 in. (2.83 cm) |
| Shipping weight | Approximately 4.75 lb (2.16 kg) |
| Operating temperature | 41°F to 104°F (5°C to 40°C)<br>Short-term operating temperature is limited to 131°F (55°C) in compliance with Bellcore GR |
| Relative humidity | Operating—nominal: 5% to 85%<br>Operating—short term: 5% to 90%<br>Storage: 5% to 95% |
| Storage temperature | –40°F to 158°F (–40°C to 70C °) |

# Slot Locations

The line card slot designations are shown in this section. See Figure 8-2 for line card slot designations for the Cisco 10008 router and Figure 8-3 for line card slot designations for the Cisco 10005 router.

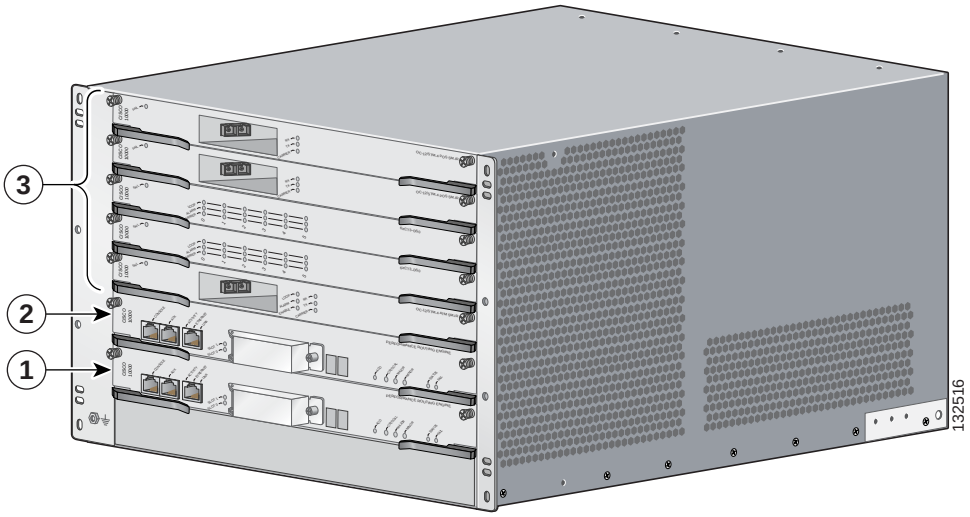
***Figure 8-2 Line Card Slot Designations for the Cisco 10008 Router***




| | | | |
|---|---|---|---|
| **1** | Blower module | **5** | PRE slot 0A |
| **2** | Primary PEM | **6** | PRE slot 0B |
| **3** | Redundant PEM | **7** | Line card slots 5 to 8 |
| **4** | Line card slots 1 to 4 | | |

The 6-port channelized T3 line card can be installed in line card slot 1 through slot 8.

*Figure 8-3 Line Card Slot Designations for the Cisco 10005 Router*




| | | | |
|---|---|---|---|
| **1** | PRE slot A | **3** | Line card slots 1 (top) to 5 (bottom) |
| **2** | PRE slot B | | |

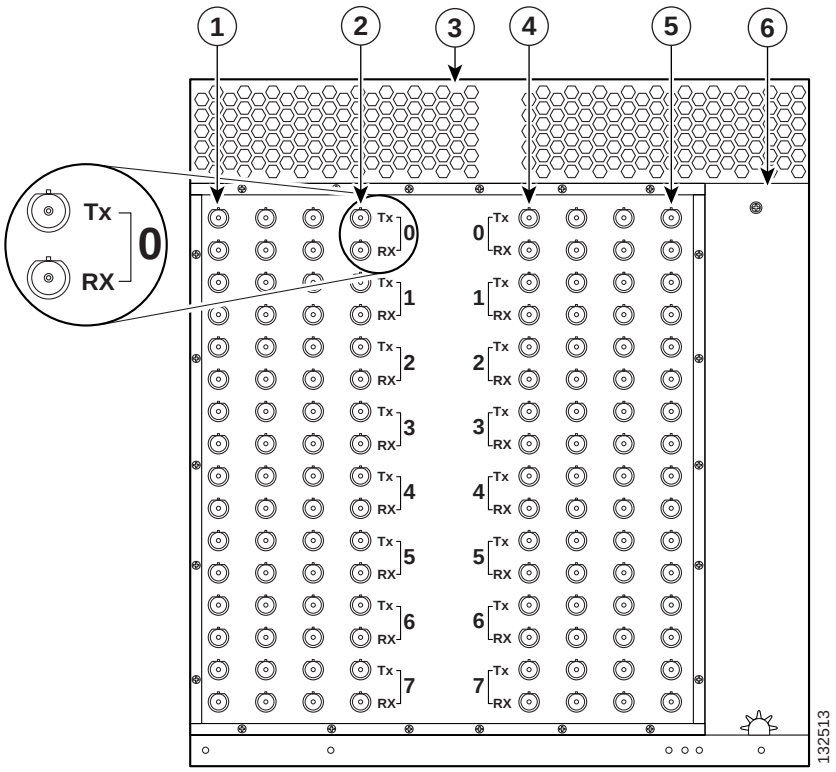
The 6-port channelized T3 line card can be installed in line card slot 1 through slot 5.

# Cables and Connectors

External network connections to the 6-port channelized T3 line card are made through the BNC connectors mounted on the rear of the Cisco 10000 chassis, using 75-ohm coaxial cable. The approved cables for use with the 6-port channelized T3 line card are cables conforming to WECO standards 728A, 734A, or 734D. Use cable lengths up to 900 ft (274.32 m). 735A cables can be used with lengths up to 225 ft (68.58 m).

See Figure 8-4 for the BNC connectors on the rear of the Cisco 10008 router, and Figure 8-5 for the BNC connectors on the rear of the Cisco 10005 router.

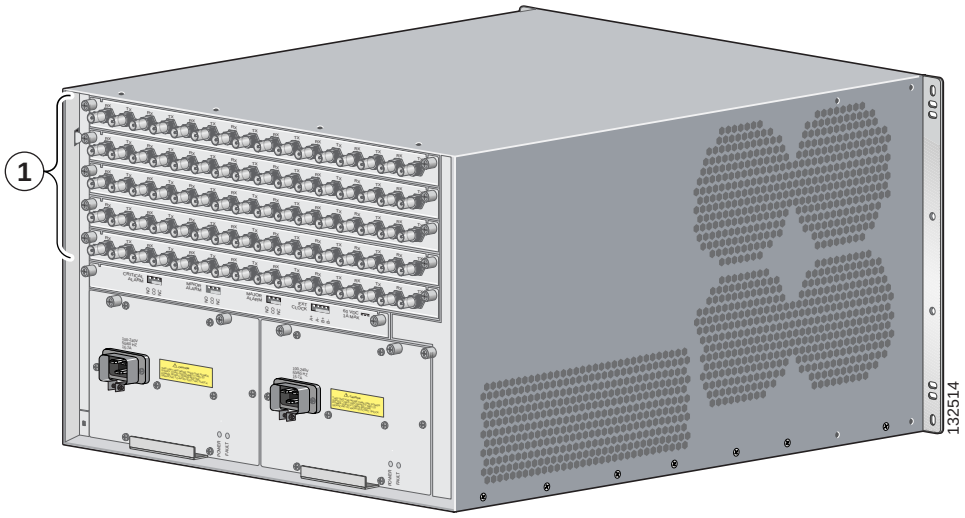
*Figure 8-4 Cisco 10008 Chassis Rear—BNC Connectors*




| | | | |
|---|---|---|---|
| **1** | Line card slot 8 | **4** | Line card slot 4 |
| **2** | Line cards slot 5 | **5** | Line card slot 1 |
| **3** | Blower module | **6** | Power supply |

The BNC connectors on the rear of the chassis, which use coaxial cable, are used with the 6-port channelized T3 line card.

*Figure 8-5 Cisco 10005 Chassis Rear—BNC Connectors*




| | | |
|---|---|---|
| **1** | Line card slots 1 (top) to 5 (bottom) | |

Also see Appendix A, "Cisco 10005 Extender Card Information" for information about the extender card which must be used with the 6-port channelized T3 line card in the Cisco 10005 chassis.

All Cisco 10005 line cards connect to a backplane in the center of the chassis, and require extender cards to deliver the alarm, BITS clock, and DS3 signals to the rear of the chassis to make them accessible. The Cisco 10005 alarm extender card and T3/E3 extender card extend and terminate these signals.

Go to Chapter 16, "Preparing for Installation" to begin the installation or replacement of the line card.

For troubleshooting information, see Chapter 18, "Troubleshooting the Installation."

PART 3

# Fast Ethernet and Gigabit Ethernet Line Cards

# 8-Port Fast Ethernet Half-Height Line Card Overview

This chapter describes the Cisco 10000 series 8-port fast Ethernet half-height line card (referred to as the 8-port fast Ethernet half-height line card), and contains the following sections:


- Line Card Summary, page 9-1
- Software and Hardware Compatibility, page 9-2
- Line Card, Router, and Processor Compatibility, page 9-2
- LEDs, page 9-3
- Physical Specifications, page 9-4
- Slot Locations, page 9-5
- Cables, Connectors, and Pinouts, page 9-6


## Line Card Summary

*Table 9-1 8-Port Fast Ethernet Half-Height Line Card Summary*

| Product Number | Description | Minimum Cisco IOS Release |
|---|---|---|
| ESR-HH-8FE-TX= | 8-port fast Ethernet half-height line card | Initial Cisco IOS releases for PRE-1:<br>12.0(23)S and later releases of Cisco IOS 12.0S<br><br>Initial Cisco IOS releases for PRE:2<br>12.2(15)BX and later releases of Cisco IOS 12.2BX<br>12.2(28)SB and later releases of Cisco IOS Release 12.2(28)SB<br>12.3(7)XI and later releases of Cisco IOS 12.3 XI<br><br>For registered Cisco.com users, use Software Advisor to determine the software releases for this line card. |
| ESR-HH-CARRIER= | Full-length base carrier for half-slot line card | 12.0(23)S and later releases of Cisco IOS 12.0S<br>12.2(28)SB and later releases of Cisco IOS Release 12.2(28)SB |
| ESR-HH-COVER= | Blank filler for half-height line cards | — |

The 8-port fast Ethernet half-height line card contains eight 100BASE-TX ports. Each port autonegotiates between half and full duplex mode. Each port supports 100BASE-T, but does not support 10BASE-T.

The 8-port fast Ethernet half-height line card provides the Cisco 10000 series router with IEEE 802.3u-compliant 100BASE-TX Ethernet interfaces to provide high-density uplinks to devices (such as content servers, routers, and other Fast Ethernet devices). Because the 8-port fast Ethernet half-height line card only occupies one half-slot, each slot can support two Fast Ethernet line cards for a total of 16 ports. The Cisco 10000 supports multiple Fast Ethernet line cards. It is also acceptable to use the other subslot for a different half-height line card.

**Note** The 8-port fast Ethernet half-height line card does not support 10BASE-T.

If you are a registered Cisco.com user, see Feature Navigator for supported features.

# Software and Hardware Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether line cards within a system are compatible, but does provide the minimum Cisco IOS requirements for individual hardware line cards, modules, or options.

**Note** Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, click **Login** at Cisco.com, type **Software Advisor** in the SEARCH box, and click **Go**. Click the link for the Software Advisor tool.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

# Line Card, Router, and Processor Compatibility

Table 9-2 lists router model, line card, and processor compatibility.

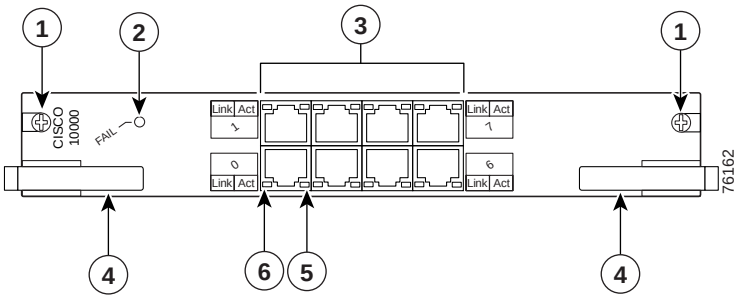
***Table 9-2 Line Card, Router, and Processor Compatibility***

| Line Card | Cisco 10008 | Cisco 10005 | PRE-2 | PRE-1 | PRE |
|---|---|---|---|---|---|
| 8-port fast Ethernet half-height line card | Yes | Yes | Yes | Yes | No |

# LEDs

The 8-port fast Ethernet half-height line card LEDs are shown in Figure 9-1.

***Figure 9-1 8-Port Fast Ethernet Half-Height Line Card Faceplate Description***




| | | | |
|---|---|---|---|
| **1** | Captive screws | **4** | Ejector levers |
| **2** | FAIL LED | **5** | ACT (active) LED—One LED for each port |
| **3** | Ports 0 to 7 RJ-45 jacks. Top Row, left to right, 1, 3, 5 and 7. Bottom row, left to right 0, 2, 4 and 6. | **6** | LINK LED—One link detected LED for each port |

Table 9-3 provides a description of the 8-port fast Ethernet half-height LEDs.

***Table 9-3 LED Description***

| LED Label | Color | State | Meaning |
|---|---|---|---|
| Fail | Yellow | Off | Off when line card is working properly. Turns on for a few second during line card power-on self test (POST), then turns off when the line card is working properly. |
| | | On | On when the line card POST fails. |
| Link | Green | On | Lights when a valid Ethernet link is detected. |
| | | Off | Off when there is no valid Ethernet link. |
| Act (active) | Green | On | Lights to indicate there is activity on the link.[1] |
| | | Off | Off when there is no activity on the link.[1] |

1. This behavior applies only to the 8-port fast Ethernet half-height line card.

# Physical Specifications

The 8-port fast Ethernet half-height line card physical specifications are listed in Table 9-4.

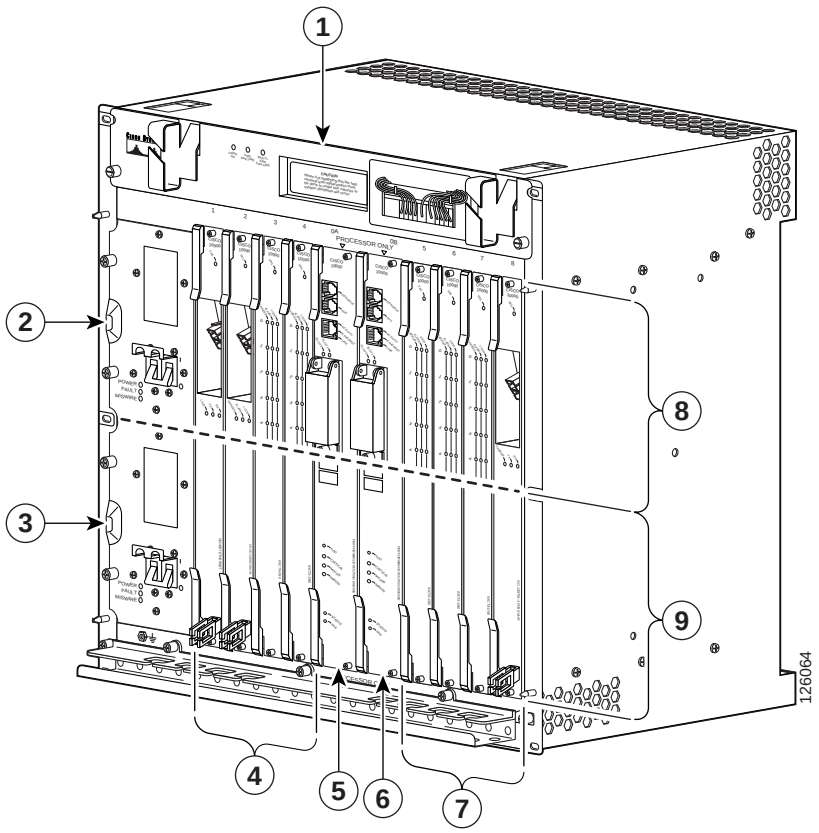
*Table 9-4 8-Port Fast Ethernet Half-Height Line Card Physical Specifications*

| Description | Specifications |
|---|---|
| Physical dimensions | Height: 7.8 in. (19.8 cm)<br>Depth: 11 in. (27.9 cm)<br>Width: 1.3 in. (3.3 cm) |
| Shipping weight | Approximately 2 lb (0.9kg) |
| Operating temperature | 41°F to 104°F (5°C to 40°C)<br>Short-term operating temperature is limited to 131°F (55°C) in compliance with Bellcore GR |
| Relative humidity | Operating—nominal: 5% to 85%<br>Operating—short term: 5% to 90%<br>Storage: 5% to 95% |
| Storage temperature | –40°F to 158°F (–40°C to 70C °) |

# Slot Locations

The line card slot designations are shown in this section. See Figure 9-2 for line card slot designations for the Cisco 10008 router and Figure 9-3 for line card slot designations for the Cisco 10005 router.

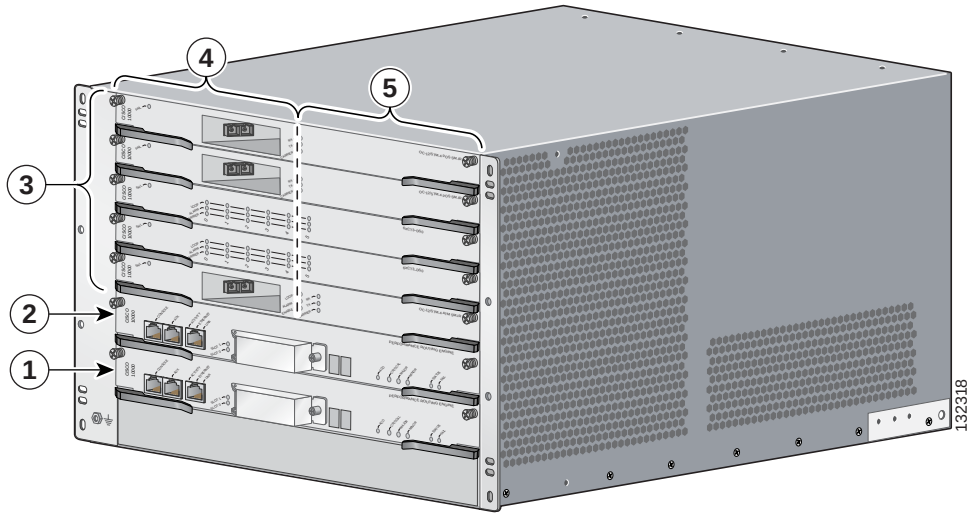
***Figure 9-2 Line Card Slot and Subslot Designations for the Cisco 10008 Router***




| | | | |
|---|---|---|---|
| **1** | Blower module | **6** | PRE slot 0B |
| **2** | Primary PEM | **7** | Line card slots 5 to 8 |
| **3** | Redundant PEM | **8** | Subslot 0 |
| **4** | Line card slots 1 to 4 | **9** | Subslot 1 |
| **5** | PRE slot 0A | | |

The 8-port fast Ethernet half-height line card can be installed in subslot 0 or subslot 1 of line card slot 1 through slot 8. The Cisco 10000 carrier is used with the 8-port fast Ethernet half-height line card.

*Figure 9-3 Line Card Slot and Subslot Designations for the Cisco 10005 Router*




| | | | |
|---|---|---|---|
| **1** | PRE slot A | **4** | Subslots 1/0 (top) to 5/0 (bottom) |
| **2** | PRE slot B | **5** | Subslots 1/1 (top) to 5/1 (bottom) |
| **3** | Line card slots 1 (top) to 5 (bottom) | | |

The 8-port fast Ethernet half-height line card can be installed in any subslot in line card slot 1 through slot 5. The Cisco 10000 Carrier is used with the 8-Port Fast Ethernet Half Height line card.

# Cables, Connectors, and Pinouts

This section provides information about cables, connectors, and pinouts.

## Cable and Connector Information

The Cisco 10000 8-port fast Ethernet half-height line card includes eight RJ-45 connectors to which you can connect Category 5 UTP cables. Cable connections to the RJ-45 connectors are not intended for outside plant connections.

**Note** To meet Class B requirements, shielded cables must be used.

Use the following cabling guidelines when planning your 100BASE-TX Fast Ethernet network:

- The maximum length for a cable segment is 100 meters.
- You can add one Class 1 repeater, or up to two Class 2 repeaters between nodes.
  - A Class 1 repeater is a high delay repeater that usually connects dissimilar media, such as UTP cables and fiber.
  - A Class 2 repeater is a low delay repeater that usually connects similar media, such as UTP cables to UTP cables.

Table 9-5 lists the maximum cable length between two nodes in a 100BASE-TX network.

***Table 9-5 Cabling Limits***

| Number of Repeaters | Maximum Cable Length between 2 Nodes (meters) |
|---|---|
| 0 | 100 |
| 1 (Class 1 or 2) | 200—100 maximum on each side of repeater |
| 2 (Class 2 only) | 205—100 maximum for each span |

# Pinouts

Table 9-6 provides pinout information for the 8-port fast Ethernet half-height line card. The 8-port fast Ethernet half-height line card does not support software configuration of the MDI mode including auto-MDIX mode. It does not support Inter-Switch Link (ISL) encapsulation (the card does support 802.1Q VLAN encapsulation), or Fast EtherChannel.

***Table 9-6 Fast Ethernet Port Pinouts—MDI Mode***

| Pin | FE Signal |
|---|---|
| 1 | TX+ |
| 2 | TX– |
| 3 | RX+ |
| 6 | RX– |

Go to Chapter 16, “Preparing for Installation” to begin the installation or replacement of the line card.

For troubleshooting information, see Chapter 18, “Troubleshooting the Installation.”

CHAPTER 10

# 1-Port Gigabit Ethernet Half-Height Line Card Overview

This chapter describes the Cisco 10000 series 1-port Gigabit Ethernet half-height line card (referred to as the 1-port Gigabit Ethernet half-height line card), and contains the following sections:


- Line Card Summary, page 10-1
- Software and Hardware Compatibility, page 10-3
- Line Card, Router, and Processor Compatibility, page 10-3
- LEDs, page 10-4
- Physical Specifications, page 10-5
- Slot Locations, page 10-6
- Cables and Connectors, page 10-7
- SFP Module Configurations and Specifications, page 10-9


## Line Card Summary

*Table 10-1 1-Port Gigabit Ethernet Half-Height Line Card Summary*

| Product Number | Description | Minimum Cisco IOS Release |
|---|---|---|
| ESR-HH-1GE= | 1-Port Gigabit Ethernet line card | Initial Cisco IOS releases for PRE-1:<br>12.0(23)S and later releases of Cisco IOS 12.0S<br>Initial Cisco IOS releases for PRE-2:<br>12.2(15)BX and later releases of Cisco IOS 12.2BX<br>12.2(28)SB and later releases of Cisco IOS Release 12.2SB<br>12.3(7)XI and later releases of Cisco IOS 12.3 XI<br>Initial Cisco IOS releases for PRE-3:<br>12.2(31)SB2 and later releases of 12.2SB2<br>For registered Cisco.com users, use Software Advisor to determine the software releases for this line card. |
| ESR-HH-CARRIER= | Full-length base carrier for half-slot line card | — |

*Table 10-1 1-Port Gigabit Ethernet Half-Height Line Card Summary(continued)*

| Product Number | Description | Minimum Cisco IOS Release |
|---|---|---|
| ESR-HH-COVER= | Blank filler for half-height line cards | — |
| SFP-GE-T= | 1000BASE-T pluggable transceiver for Category 5 copper wire | 12.2(31)SB6 and later releases of Cisco IOS 12.2SB6 |
| SFP-GE-S= (previously GLC-SX-MM=) | 1000BASE-SX pluggable transceiver | — |
| SFP-GE-L= (previously GLC-LH-SM=) | 1000BASE-LX pluggable transceiver | — |
| GLC-ZX-SM= (previously ESR-SFP-ZX=) | 1000BASE-ZX pluggable transceiver | — |
| CWDM-SFP-1470 | Longwave 1470 nm laser, single mode Color: Gray | 12.2(28)SB1 and later releases of Cisco IOS 12.2SB |
| CWDM-SFP-1490 | Longwave 1490 nm laser, single mode Color: Violet | 12.2(28)SB1 and later releases of Cisco IOS 12.2SB |
| CWDM-SFP-1510 | Longwave 1510 nm laser, single mode Color Identifier: Blue | 12.2(28)SB1 and later releases of Cisco IOS 12.2SB |
| CWDM-SFP-1530 | Longwave 1530 nm laser, single mode Color Identifier: Green | 12.2(28)SB1 and later releases of Cisco IOS 12.2SB |
| CWDM-SFP-1550 | Longwave 1550 nm laser, single mode Color Identifier: Yellow | 12.2(28)SB1 and later releases of Cisco IOS 12.2SB |
| CWDM-SFP-1570 | Longwave 1570 nm laser, single mode Color Identifier: Orange | 12.2(28)SB1 and later releases of Cisco IOS 12.2SB |
| CWDM-SFP-1590 | Longwave 1590 nm laser, single mode Color Identifier: Red | 12.2(28)SB1 and later releases of Cisco IOS 12.2SB |
| CWDM-SFP-1610 | Longwave 1610 nm laser, single mode Color Identifier: Brown | 12.2(28)SB1 and later releases of Cisco IOS 12.2SB |

The 1-port Gigabit Ethernet half-height line card:

- Contains one Gigabit Ethernet port that provides a trunk uplink to switches and core routers
- Provides the Cisco 10000 series with an IEEE 802.3z-compliant Ethernet interface that can run up to 1 Gbps in full duplex mode.

**Note** Bandwidth can reach a theoretical maximum of 711 Mbps due to backplane limitations of the PRE-1 (Part Number ESR-PRE1). The backplane bandwidth is not a limitation when using the PRE-2 (Part Number ESR-PRE2) or future PREs.

You install this line card in a Cisco 10000 chassis half-height slot carrier, which you must first install in the Cisco 10000 chassis slot. You can run this line card with a second line card in the other subslot.

The line card uses a small form-factor pluggable (SFP) module that supports a variety of Gigabit Ethernet interface types (SX, LX/LH, ZX, BASET, and CWDM), which you can change or upgrade at any time.

For more information about Coarse Wave Division Multiplexer (CWDM) Small Form-Factor Pluggable (SFP) laser optical transceiver modules, see the *Cisco CWDM GBIC and CWDM SFP Installation Note* at:

http://www.cisco.com/univercd/cc/td/doc/product/gbic_sfp/gbic_doc/78_15222.htm

**Note** Only SFP modules purchased from Cisco work with the Gigabit Ethernet line card software.

If you are a registered Cisco.com user, see Feature Navigator for supported features.

# Software and Hardware Compatibility

To check the minimum software requirements of Cisco IOS software for the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether line cards within a system are compatible, but provides the minimum Cisco IOS requirements for individual hardware line cards, modules, or options.

**Note** Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, go to Cisco.com and click **Login**, type **Software Advisor** in the Search box, and click **Go**. Click the link for the Software Advisor tool.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

# Line Card, Router, and Processor Compatibility

Table 10-2 lists router model, line card, and processor compatibility.

***Table 10-2 Line Card, Router, and Processor Compatibility***

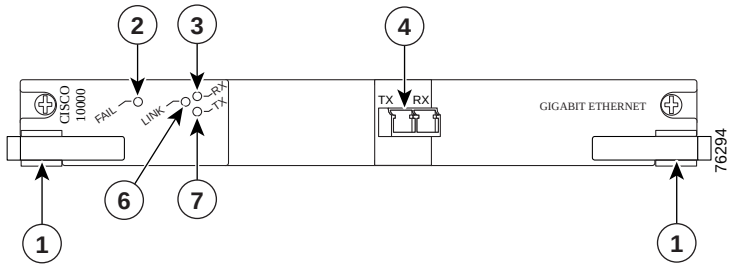
| Line Card | Cisco 10008 | Cisco 10005 | PRE-3 | PRE-2 | PRE-1[1] | PRE |
|---|---|---|---|---|---|---|
| 1-port Gigabit Ethernet half-height line card | Yes | Yes | Yes | Yes | Yes | No |

1. Using the 1-port Gigabit Ethernet half-height line card with the PRE-1 is not recommended because of the bandwidth limitations on the PRE-1. Line rate speed in not achievable with the configuration of the 1-port Gigabit Ethernet half-height line card and PRE-1.

# LEDs

The 1-port Gigabit Ethernet half-height line card LEDs are listed in Figure 10-1.

***Figure 10-1 1-Port Gigabit Ethernet Half-Height Line Card Faceplate Description***




| | | | |
|---|---|---|---|
| **1** | Ejector levers | **4** | SFP module port (TX/RX) |
| **2** | FAIL LED | **6** | LINK LED |
| **3** | RX (receive) LED | **7** | TX (transmit) LED |

Table 10-3 provides a description of the 1-port Gigabit Ethernet half-height line card LEDs.

***Table 10-3 LED Description***

| LED Label | Color | State | Meaning |
|---|---|---|---|
| FAIL | Yellow | Off | Off when line card is working properly. Turns on for a few seconds during line card power-on self test (POST), then turns off. |
| | | Blinking | The FAIL LED blinks during the following SFP module faults:<br>• An SFP module other than a Cisco brand is inserted.<br>• A non-Gigabit Ethernet SFP module is inserted.<br>• A hardware problem occurs in a valid SFP module. |
| | | On | The FAIL LED may blink in different patterns for certain POST failures (slot ID parity error and BPE loopback test failure).<br>If the line card POST fails.<br>If any failure occurs. |
| RX (receive) | Green | On | The port is receiving traffic. |
| | | Off | The port is not receiving traffic. |
| TX (transmit) | Green | On | The port is transmitting traffic. |
| | | Off | The port is not transmitting traffic. |

*Table 10-3 LED Description(continued)*

| LED Label | Color | State | Meaning |
|---|---|---|---|
| LINK | Green | On | Carrier detected; the port is able to pass traffic. This LED can also be on if the line card is in internal loopback. |
| | | Off | No carrier signal is detected; the negotiation failed, or the port is administratively down. |

**Note** Because this line card operates in full-duplex mode, both the RX and TX LEDs can be on at the same time.

# Physical Specifications

The 1-port Gigabit Ethernet half-height line card physical specifications appear in Table 10-4.

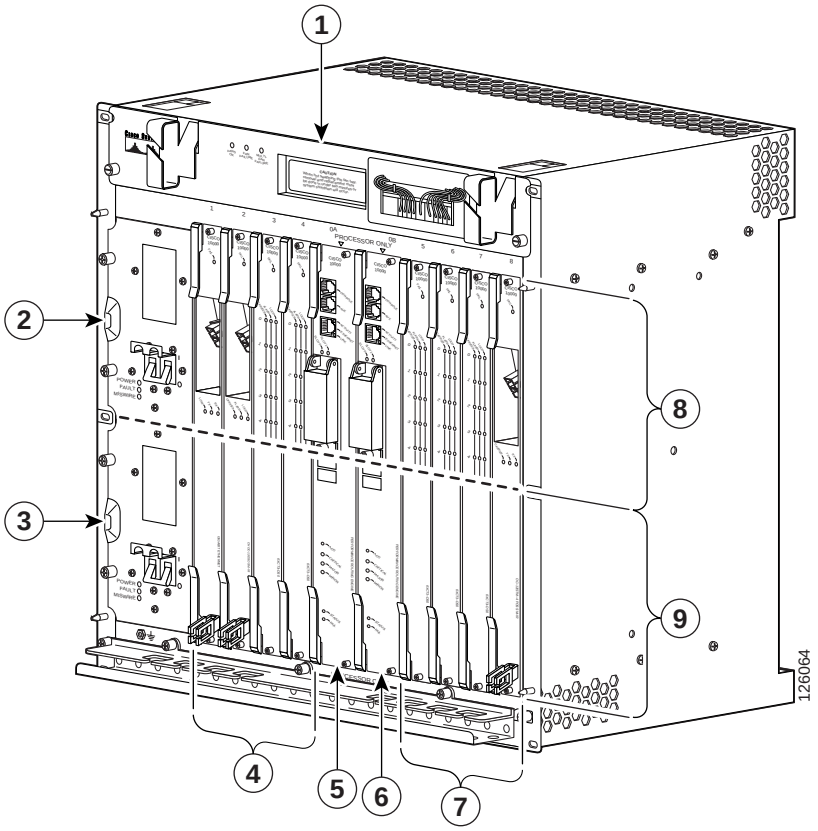
*Table 10-4 1-Port Gigabit Ethernet Half-Height Line Card Physical Specifications*

| Description | Specifications |
|---|---|
| Physical dimensions | Height:7.8 in. (19.8 cm)<br>Depth:11 in. (27.9 cm)<br>Width: 1.3 in. (3.3 cm) |
| Shipping weight | Approximately 2 lb (0.9kg) |
| Operating temperature | 41°F to 104°F (5°C to 40°C)<br>Short-term operating temperature is limited to 131°F (55°C) in compliance with Bellcore GR |
| Relative humidity | Operating—nominal: 5% to 85%<br>Operating—short term: 5% to 90%<br>Storage: 5% to 95% |
| Storage temperature | –40°F to 158°F (–40°C to 70C °) |

# Slot Locations

The line card slot designations are shown in this section. Figure 10-2 shows line card slot designations for the Cisco 10008 router and Figure 10-3 shows line card slot designations for the Cisco 10005 router.

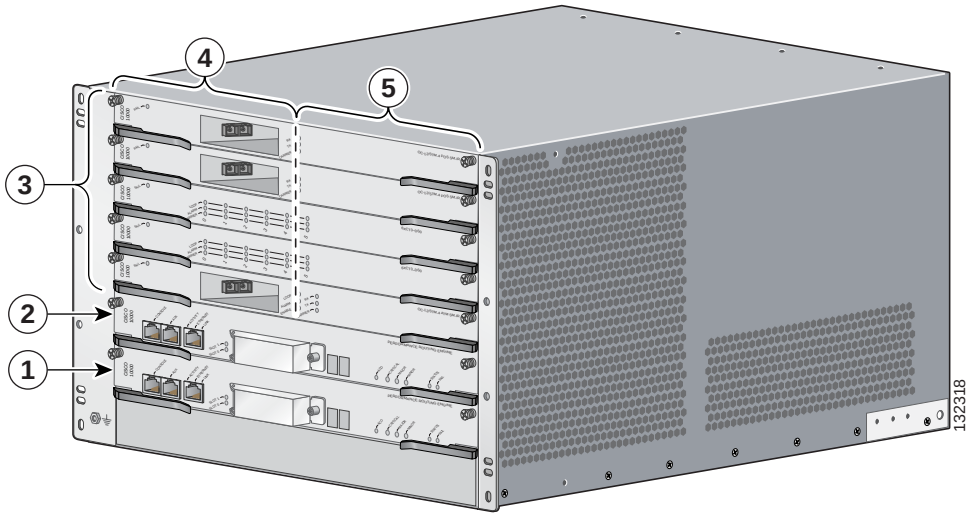
***Figure 10-2 Line Card Slot and Subslot Designations for the Cisco 10008 Router***




| | | | |
|---|---|---|---|
| **1** | Blower module | **6** | PRE slot B |
| **2** | Primary PEM | **7** | Line card slots 5 to 8 |
| **3** | Redundant PEM | **8** | Subslot 0 |
| **4** | Line card slots 1 to 4 | **9** | Subslot 1 |
| **5** | PRE slot A | | |

The 1-port Gigabit Ethernet half-height line card can be installed in subslot 0 or subslot 1 of the line card slot 1 through slot 8. The Cisco 10000 Carrier is used with the 1-Port Gigabit Ethernet Half Height line card.

*Figure 10-3 Line Card Slot and Subslot Designations for the Cisco 10005 Router*




| | | | |
|---|---|---|---|
| **1** | PRE slot A | **4** | Subslots 1/0 (top) to 5/0 (bottom) |
| **2** | PRE slot B | **5** | Subslots 1/1 (top) to 5/1 (bottom) |
| **3** | Line card slots 1 (top) to 5 (bottom) | | |

The 1-port Gigabit Ethernet half-height line card can be installed in any subslot in line card slot 1 through slot 5. The Cisco 10000 Carrier is used with the 1-port Gigabit Ethernet half-height line card.

# Cables and Connectors

The 1-port Gigabit Ethernet half-height line card supports single Ethernet interfaces based on SFP technology. The following SFP modules are supported by this line card:

- 1000BASE-SX SFP—The SFP-GE-S=, 1000BASE-SX SFP module operates on ordinary multimode fiber-optic link spans of up to 550 meters in length.
- 1000BASE-LX/LH SFP—The SFP-GE-L=, 1000BASE-LX/LH SFP module operates on ordinary single-mode fiber-optic link spans of up to 10,000 meters in length.
- 1000BASE-ZX SFP—The GLC-ZX-SM=, 1000BASE-ZX SFP module operates on ordinary single mode fiber-optic link spans of up to 70 kilometers in length. Link spans of up to 100 km are possible using premium single-mode fiber or dispersion-shifted single-mode fiber. The SFP module provides an optical link budget of 23 dB—the precise link span length depends on multiple factors such as fiber quality, number of splices, and connectors.
- 1000BASE-T SFP—The SFP-GE-T (1000BASE-T copper SFP module) provides full-duplex Gigabit Ethernet connectivity to high-end workstations and between wiring closets over an existing copper network infrastructure. The SFP-GE-T maximum cabling distance is 328 feet (100 m).

The Coarse Wave Division Multiplexer (CWDM) Small Form-Factor Pluggables (SFPs) are hot-swappable, laser optical transceiver modules. You can plug these SFPs into standard receptacles in Cisco routers and switches to convert Gigabit Ethernet electrical signals into a single-mode fiber-optic (SMF) interface. The router supports the following CWDM SFPs:

- CWDM-SFP-1470 SFP—Longwave 1470 nm laser, single mode
- CWDM-SFP-1490 SFP—Longwave 1490 nm laser, single mode
- CWDM-SFP-1510 SFP—Longwave 1510 nm laser, single mode
- CWDM-SFP-1530 SFP—Longwave 1530 nm laser, single mode
- CWDM-SFP-1550 SFP—Longwave 1550 nm laser, single mode
- CWDM-SFP-1570 SFP—Longwave 1570 nm laser, single mode
- CWDM-SFP-1590 SFP—Longwave 1590 nm laser, single mode
- CWDM-SFP-1610 SFP—Longwave 1610 nm laser, single mode

You can connect the CWDM SFPs to CWDM passive optical system optical add/drop multiplexer (OADM) or multiplexer/demultiplexer plug-in modules using single-mode fiber-optic cables with standard LC connectors. For more information, see the *Cisco CWDM GBIC and CWDM SFP Installation Note* at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/gbic_sfp/gbic_doc/78_15222.htm

When shorter distances of single-mode fiber are used, it may be necessary to insert an inline optical attenuator in the link to avoid overloading the receiver. A 5-decibel (dB) or 10-dB inline optical attenuator should be inserted between the fiber-optic cable plant and the receiving port on the GLC-ZX-SM= at each end of the link whenever the fiber-optic cable span is less than 25 km. CWDM SFPs require a minimum of 12-dB optical attenuation. If the fiber itself is not providing the attenuation, then an attenuator device is required.

**Note** The required line card SFP module is shipped installed in the line card. Cisco sells individual SFP modules separately and you can change the type of Gigabit Ethernet interface supported by this line card by changing its SFP module.

Use these guidelines for installing SFP modules:

- There is no correlation of the type of latch to the model (such as SX or LH) or technology type (such as Gigabit Ethernet) of SFP modules. Always read the label on the SFP module to determine the technology type and model.
- You can install and remove SFP modules with power on to the system.
- Disconnect all cables before removing or installing an SFP module. We strongly recommend that you do *not* install or remove the SFP module with optical fiber cables attached to it.
- SFP modules are keyed to prevent incorrect insertion.

# SFP Module Configurations and Specifications

Table 10-5 lists the SFP configurations.

***Table 10-5 SFP Configurations***

| Product ID | Type |
|---|---|
| SFP-GE-S= | Short wavelength (1000BASE-SX) |
| SFP-GE-L= | Long wavelength/long haul (1000BASE-LX) |
| SFP-GE-T= | RJ-45 copper SFP module (1000BASE-T) |

Table 10-6 lists the SFP physical specifications.

***Table 10-6 SFP Specifications***

| Specification | Description |
|---|---|
| Optical SFP module dimensions | Height: 0.33 in. (8.5 mm)<br>Width: 2.22 in. (56.5 mm)<br>Depth: 0.53 in. (13.4 mm) |
| Optical connectors | Multimode fiber-optic: LC<br>Single-mode fiber-optic: LC |
| RJ-45 (copper) SFP module maximum dimensions | Height: 0.55 in. (14.0 mm)<br>Width: 0.54 in. (13.7 mm)<br>Depth: 2.8 in. (71.1 mm) |
| RJ-45 (copper) SFP module connector | RJ-45 |

Table 10-7 lists the SFP port cabling specifications.

***Table 10-7 SFP Port Cabling Specifications***

| SFP Module | Wavelength (nm) | Fiber Type | Core Size (microns) | Modal Bandwidth (MHz/km) | Cable Distance |
|---|---|---|---|---|---|
| 1000BASE-T<br>SFP-GE-T= | N/A | Copper | N/A | N/A | 328 ft. (100 m) |
| 1000BASE-SX<br>SFP-GE-S=<br>(previously<br>GLC-SX-MM=) | 850 | MMF | 62.5<br>62.5<br>50.0<br>50.0 | 160<br>200<br>400<br>500 | 722 ft (220 m)<br>902 ft (275 m)<br>1640 ft (500 m)<br>1804 ft (550 m) |
| 1000BASE-LX/LH<br>SFP-GE-L=<br>(previously<br>GLC-LH-SM=) | 1300 | MMF[1]<br><br><br>SMF | 62.5<br>50.0<br>50.0<br>9/10 | 500<br>400<br>500<br>— | 1804 ft (550 m)<br>1804 ft (550 m)<br>1804 ft (550 m)<br><br>6.2 miles (10 km) |

*Table 10-7 SFP Port Cabling Specifications (continued)*

| SFP Module | Wavelength (nm) | Fiber Type | Core Size (microns) | Modal Bandwidth (MHz/km) | Cable Distance |
|---|---|---|---|---|---|
| 1000BASE-ZX GLC-ZX-SM=) | 1550 | SMF | 9/10 | — | 43.5 miles (70 km) |
| | | SMF[2] | 8 | — | 62.1 miles (100 km) |
| CWDM-SFP-####= | 1470 through 1610 | SMF | — | — | — |

1. A mode-conditioning patch cord is required. Using an ordinary patch cord with MMF, 1000BASE-LX/LH SFP modules, and a short link distance (tens s of meters) can cause transceiver saturation resulting in an elevated bit error rate (BER). In addition, when using the LX/LH SFP module with 62.5-micron diameter MMF, you must install a mode-conditioning patch cord between the SFP module and the MMF cable on both the transmit and receive ends of the link. The mode-conditioning patch cord is required for link distances greater than 984 ft (300 m).
2. Dispersion-shifted single-mode fiber-optic cable.

Table 10-8 provides SFP module power budget information.

*Table 10-8 Gigabit Ethernet SFP Transmit Power, Receive Power, and Power Budget*

| | Transmit Power | | Receive Power | | |
|---|---|---|---|---|---|
| SFP Module | Minimum | Maximum | Minimum | Maximum | Power Budget |
| SFP-GE-S= | –9.5 dBm[1] | –4 dBm[1] | –17 dBm | 0 dBm | 7.5 dBm[2] |
| SFP-GE-L= | –9.5 dBm[3]<br>–11.5dBm[4] | –3 dBm[5] | –20 dBm | –3 dBm | 7.5 dBm[6] and 8.0 dBm[7] |
| GLC-ZX-SM= | 0 dBm | 5 dBm | –23 dBm | 0 dBm | –24 dBm |
| CWDM-SFP-####= | 0 dBm | 5 dBm | -28 dBm | -7 dBm | 28 dB |

1. For fiber types 50/125 µm, NA = 0.20 fiber and 62.5/125 µm, NA = 0.275 fiber.
2. For fiber types 50/125 µm MMF and 62.5/125 µm MMF.
3. For fiber types 9/125 µm SMF.
4. For fiber types 62.5/125 µm MMF and 50/125 µm MMF.
5. For fiber types 9/125 µm SMF, 62.5/125 µm MMF, and 50/125 µm MMF.
6. For fiber types 50/125 µm MMF and 62.5/125 µm MMF.
7. For fiber type 10 µm SMF.

# Related Documentation

For related documentation on SFP modules, see the following publications:

- *Gigabit Interface Converter (GBIC) Module and Small Form-Factor Pluggable (SFP) GBIC Module Installation Information and Specifications*
- *Cisco SFP Optics for Gigabit Ethernet Applications Data Sheet*
- *Cisco 1000BASE-T SFP Data Sheet*

# Mode-Conditioning Gigabit Ethernet Patch Cord Description

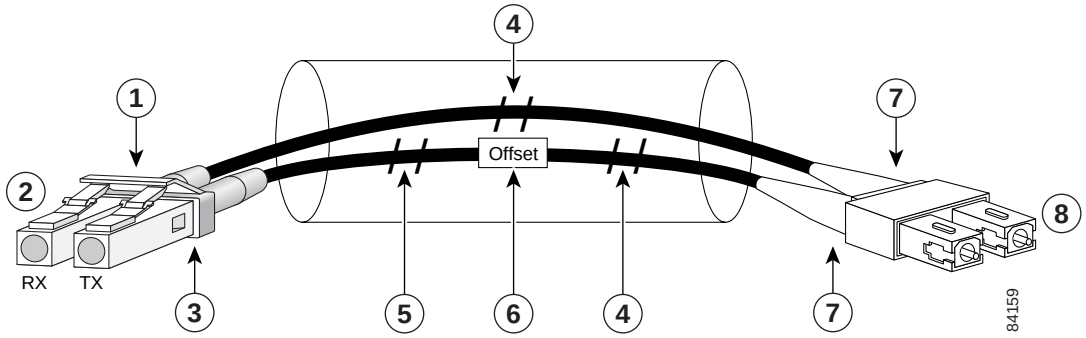
A mode-conditioning patch cord can be used with the SFP-GE-L= (SFP module) to allow reliable laser transmission between the single-mode laser source on the SFP module and a multimode optical fiber cable.

When an unconditioned laser source designed for operation on single-mode optical fiber is directly coupled to a multimode optical fiber cable, an effect known as *differential mode delay* (DMD) might result in a degradation of the modal bandwidth of the optical fiber cable.

This degradation results in a decrease in the link span (the distance between a transmitter and a receiver) that can be supported reliably. The effect of DMD can be overcome by conditioning the launch characteristics of a laser source. A practical means of performing this conditioning is to use a device called a mode-conditioning patch cord.

A mode-conditioning patch cord is an optical fiber cable assembly that consists of a pair of optical fibers terminated with connector hardware. Specifically, the mode-conditioning patch cord is composed of a single-mode optical fiber permanently coupled off-center (see Offset in Figure 10-4) to a graded-index multimode optical fiber. Figure 10-4 shows a diagram of the mode-conditioning patch cord assembly.

***Figure 10-4 Mode-Conditioning Patch Cord Assembly for an SFP Module***




| | | | |
|---|---|---|---|
| **1** | Gray color identifier | **5** | Single-mode bar |
| **2** | To Gigabit Ethernet interface | **6** | Offset |
| **3** | Blue color identifier | **7** | Beige color identifier |
| **4** | Multimode bar | **8** | To cable plant |

The mode-conditioning patch cord assembly is composed of duplex optical fibers, including a single-mode-to-multimode offset launch fiber connected to the transmitter, and a second conventional graded-index multimode optical fiber connected to the receiver. The use of a plug-to-plug patch cord maximizes the power budget of multimode 1000BASE-LX and 1000BASE-LH links.

The mode-conditioning patch cord is required to comply with IEEE standards. The IEEE found that link distances could not be met with certain types of fiber-optic cable cores. The solution is to launch light from the laser at a precise offset from the center, which is accomplished by using the mode-conditioning patch cord. At the output of the patch cord, the SFP-GE-L= is compliant with the IEEE 802.3z standard for 1000BASE-LX.

Go to Chapter 16, “Preparing for Installation” to begin the installation or replacement of the line card. For troubleshooting information, see Chapter 18, “Troubleshooting the Installation.”

# 1-Port Gigabit Ethernet Line Card Overview

This chapter describes the Cisco 10000 series 1-port Gigabit Ethernet line card (referred to as the 1-port Gigabit Ethernet line card), and contains the following sections:


- Line Card Summary, page 11-1
- Software and Hardware Compatibility, page 11-2
- Line Card, Router, and Processor Compatibility, page 11-2
- LEDs, page 11-3
- Physical Specifications, page 11-4
- Slot Locations, page 11-5
- Cables and Connectors, page 11-6


## Line Card Summary

*Table 11-1 1-Port Gigabit Ethernet Line Card Summary*

| Product Number | Description | Minimum Cisco IOS Release |
|---|---|---|
| ESR-1GE= | 1-port Gigabit Ethernet line card | Initial Cisco IOS releases for PRE-1:<br>12.0(22)S and later releases of Cisco IOS 12.0S<br>Initial Cisco IOS releases for PRE-2:<br>12.3(7)XI and later releases of Cisco IOS Release 12.3X<br>12.0(22)S and later releases of Cisco IOS 12.0S<br>12.2(28)SB and later releases of Cisco IOS Release 12.2(28)SB<br>Initial Cisco IOS releases for PRE-3:<br>12.2(31)SB2 and later releases of Cisco IOS Release 12.2SB2<br>For registered Cisco.com users, use Software Advisor to determine the software releases for this line card. |
| WS-G5484= | 1000BASE-SX GBIC | — |
| WS-G5486= | 1000BASE-LX/LH GBIC | — |
| WS-G5487= | 1000BASE-ZX GBIC | — |

The 1-port Gigabit Ethernet line card provides:

- A trunk uplink to the core for Gigabit Ethernet aggregation
- The Cisco 10000 system with an IEEE 802.3z-compliant Ethernet interface running at 1 Gbps in full-duplex mode

The Cisco 10000 system supports multiple Gigabit Ethernet line cards to support connectivity to multiple destinations and for redundant and fault-tolerant configurations.

The port uses a Gigabit Interface Converter (GBIC) that supports Gigabit Ethernet rates on a variety of Gigabit Ethernet interface types (SX, LH/LX, ZX) which you can change or upgrade at any time (see Table 11-5).

If you are a registered Cisco.com user, see Feature Navigator for supported features.

# Software and Hardware Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether line cards within a system are compatible, but does provide the minimum Cisco IOS requirements for individual hardware line cards, modules, or options.

**Note** Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, click **Login** at Cisco.com, type **Software Advisor** in the SEARCH box, and click **Go**. Click the link for the Software Advisor tool.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

# Line Card, Router, and Processor Compatibility

Table 11-2 lists router model, line card, and processor compatibility.

***Table 11-2 Line Card, Router, and Processor Compatibility***

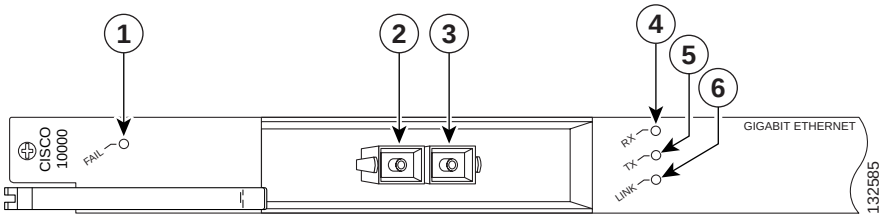
| Line Card | Cisco 10008 | Cisco 10005 | PRE-3 | PRE-2 | PRE-1 | PRE |
|---|---|---|---|---|---|---|
| 1-port Gigabit Ethernet line card | Yes | Yes | Yes | Yes | Yes | No |

**Note** When using the PRE or PRE-1 with the 1-port Gigabit Ethernet line card, the traffic line rate is frame size 70 and above.

# LEDs

The 1-port Gigabit Ethernet line card LEDs are shown in Figure 11-1.

***Figure 11-1 1-Port Gigabit Ethernet Line Card Faceplate Description***




| | | | |
|---|---|---|---|
| **1** | FAIL LED | **4** | RX LED |
| **2** | RX (receive) | **5** | TX LED |
| **3** | TX (transmit) | **6** | LINK LED |

Table 11-3 provides a description of the 1-port Gigabit Ethernet line card LEDs.

***Table 11-3 LEDs Description***

| LED Label | Color | State | Meaning |
|---|---|---|---|
| FAIL | Yellow | Off | Off when line card is working properly. Turns on for a few seconds during line card power-on self test (POST), then turns off when the line card is working properly. |
| | | Blinking | Blinks when the GBIC is bad. |
| | | On | On when the line card POST fails. |
| RX (receive) | Green | On | The port is receiving traffic. |
| | | Off | The port is not receiving traffic. |
| TX (transmit) | Green | On | The port is transmitting traffic. |
| | | Off | The port is not transmitting traffic. |
| LINK | Green | On | On when the link is up. |
| | | Off | Off when the link is down. |

# Physical Specifications

The 1-port Gigabit Ethernet line card physical specifications are shown in Table 11-4.

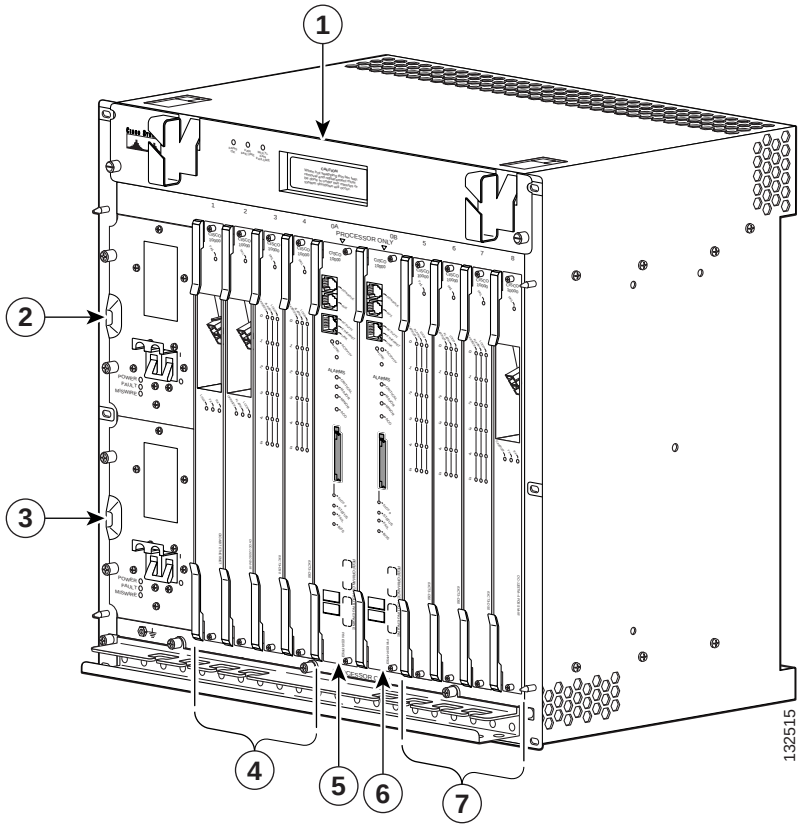
***Table 11-4 1-Port Gigabit Ethernet Line Card Physical Specifications***

| Description | Specifications |
|---|---|
| Physical dimensions | Height: 16.0 in. (40.64 cm)<br>Depth: 9.97 in. (25.32 cm)<br>Width: 1.12 in. (2.83 cm) |
| Shipping weight | Approximately 4.75 lb (2.16 kg) |
| Operating temperature | 41°F to 104°F (5°C to 40°C)<br>Short-term operating temperature is limited to 131°F (55°C) in compliance with Bellcore GR |
| Relative humidity | Operating—nominal: 5% to 85%<br>Operating—short term: 5% to 90%<br>Storage: 5% to 95% |
| Storage temperature | –40°F to 158°F (–40°C to 70C °) |

# Slot Locations

The line card slot designations are shown in this section. See Figure 11-2 for line card slot designations for the Cisco 10008 router and Figure 11-3 for line card slot designations for the Cisco 10005 router.

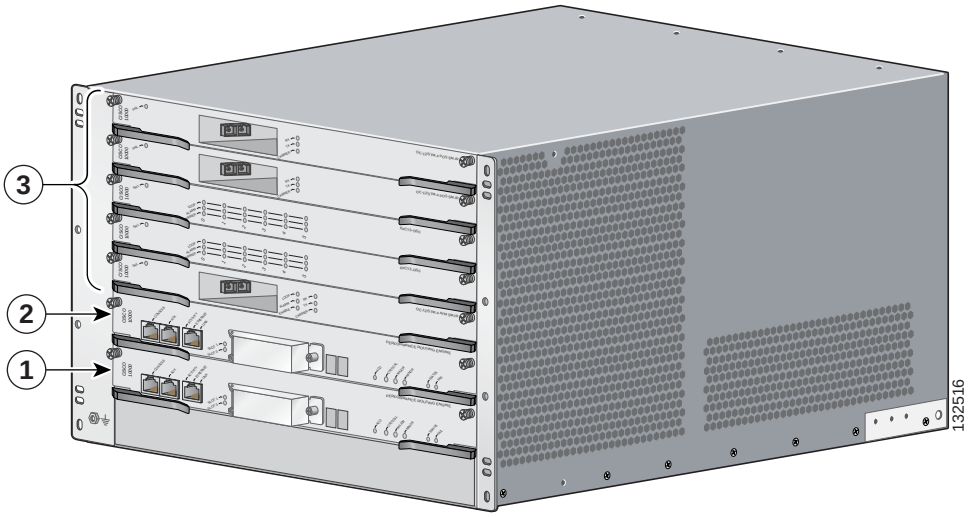
***Figure 11-2 Line Card Slot Designations for the Cisco 10008 Router***




| | | | |
|---|---|---|---|
| **1** | Blower module | **5** | PRE slot 0A |
| **2** | Primary PEM | **6** | PRE slot 0B |
| **3** | Redundant PEM | **7** | Line card slots 5 to 8 |
| **4** | Line card slots 1 to 4 | | |

The 1-port Gigabit Ethernet line card can be installed in line card slot 1 through slot 8.

*Figure 11-3 Line Card Slot Designations for the Cisco 10005 Router*




| | | | |
|---|---|---|---|
| **1** | PRE slot A | **3** | Line card slots 1 (top) to 5 (bottom) |
| **2** | PRE slot B | | |

The 1-port Gigabit Ethernet line card can be installed in line card slot 1 through slot 5.

# Cables and Connectors

Table 11-5 lists the 1-port Gigabit Ethernet line card GBIC modules and their respective cable types and lengths.

Use these guidelines for installing GBIC modules:

- There is no correlation of the type of latch to the model (such as SX or LH) or technology type (such as Gigabit Ethernet) of GBIC modules. Always read the label on the GBIC module to determine the technology type and model.
- You can install and remove GBIC modules with power on to the system.
- Disconnect all cables before removing or installing a GBIC module. We strongly recommend that you do *not* install or remove the GBIC module with optical fiber cables attached to it.
- GBIC modules are keyed to prevent incorrect insertion.

*Table 11-5 GBIC Port Cabling Specifications*

| GBIC | Wavelength (nm) | Fiber Type | Core Size (microns) | Modal Bandwidth (MHz km) | Cable Distance |
|---|---|---|---|---|---|
| 1000BASE-SX<br>WS-G5484<br>(previously<br>ESR-GBIC-SX) | 850 | MMF<br><br><br><br> | 62.5<br>62.5<br>50.0<br>50.0 | 160<br>200<br>400<br>500 | 722 ft (220 m)<br>902 ft (275 m)<br>1640 ft (500 m)<br>1804 ft (550 m) |
| 1000BASE-LX/LH<br>WS-G5486<br>(previously<br>ESR-GBIC-LHLX) | 1300 | MMF[1]<br><br><br>SMF | 62.5<br>50.0<br>50.0<br>8 to 10 | 500<br>400<br>500<br>— | 1804 ft (550 m)<br>1804 ft (550 m)<br>1804 ft (550 m)<br>6.2 miles (10 km) |
| 1000BASE-ZX<br>WS-G5487<br>(previously<br>ESR-GBIC-ZX) | 1550 | SMF | Not<br>Conditional | — | 43.5 mi (70 km) to<br>62 mi (100 km)[2] |

1. Mode-conditioning patch cord (CAB-GELX-625 or equivalent) is required. If you use an ordinary patch cord with MMF, 1000BASE-LX/LH GBICs, and a short link distance (tens of meters), this can cause transceiver saturation, resulting in an elevated bit error rate (BER). In addition, when you use the LX/LH GBIC with 62.5-micron diameter MMF, you must install a mode-conditioning patch cord between the GBIC and the MMF cable on both the transmit and receive ends of the link. The mode-conditioning patch cord is required for link distances greater than 984 ft (300 m).
2. 100 km over premium single-mode fiber or dispersion shifted single-mode fiber.

# Specifications for the Gigabit Ethernet GBIC Module

Table 11-6 lists the GBIC module physical specifications.

*Table 11-6 Gigabit Ethernet GBIC Module Specifications*

| Specification | Description |
|---|---|
| Dimensions (H x W x D) | Height: 0.39 in. (1 cm)<br>Depth: 1.18 in. (3 cm)<br>Width: 2.56 in. (6.5 cm) |
| Connectors | Multimode fiber-optic: SC<br>Single-mode fiber-optic: SC |

Table 11-7 provides the optical power budget for the 1-port Gigabit Ethernet line card.

*Table 11-7 Gigabit Ethernet GBIC Transmit Power, Receive Power, and Power Budget*

| GBIC | Transmit Power | | Receive Power | | Power Budget |
|---|---|---|---|---|---|
| | Minimum | Maximum | Minimum | Maximum | |
| 10000BASE-SX<br>WS-G5484 | –9.5 dBm[1] | –4 dBm[1] | –17 dBm | 0 dBm | 7.5 dBm[2] |

*Table 11-7 Gigabit Ethernet GBIC Transmit Power, Receive Power, and Power Budget (continued)*

| GBIC | Transmit Power | | Receive Power | | Power Budget |
|---|---|---|---|---|---|
| 1000BASE-LX/LH WS-G5486 | (SMF) –9.5 dBm[3]<br>(MMF) –11.5dBm[4] | –3 dBm[5] | –19 dBm | –3 dBm | (SMF) 9.5 dBm[4]<br>(MMF) 7.5 dBm[3] |
| 1000BASE-ZX WS-G5487 | 0 dBm | 5 dBm | –23 dBm | –3 dBm | –23 dBm |

1. For fiber types 50/125 mm, NA = 0.20 fiber and 62.5/125 mm, NA = 0.275 fiber.
2. For fiber types 50/125 mm MMF and 62.5/125 mm MMF.
3. For fiber types 9/125 mm SMF.
4. For fiber types 62.5/125 mm MMF and 50/125 mm MMF.
5. For fiber types 9/125 mm SMF, 62.5/125 mm MMF, and 50/125 mm MMF.

# Mode-Conditioning Gigabit Ethernet Patch Cord Description

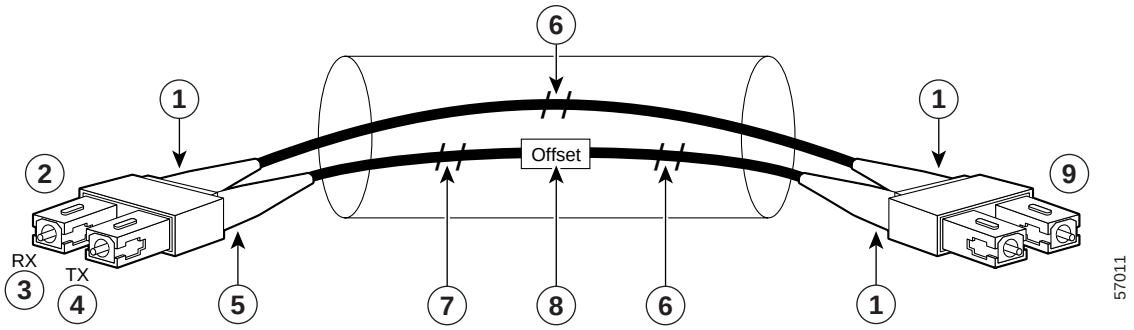
A mode-conditioning patch cord can be used with the WS-G5486 (GBIC module) to allow reliable laser transmission between the single-mode laser source on the GBIC module and a multimode optical fiber cable.

When an unconditioned laser source designed for operation on single-mode optical fiber is directly coupled to a multimode optical fiber cable, an effect known as *differential mode delay* (DMD) might result in a degradation of the modal bandwidth of the optical fiber cable.

This degradation results in a decrease in the link span (the distance between a transmitter and a receiver) that can be supported reliably. The effect of DMD can be overcome by conditioning the launch characteristics of a laser source. A practical means of performing this conditioning is to use a device called a mode-conditioning patch cord.

A mode-conditioning patch cord is an optical fiber cable assembly that consists of a pair of optical fibers terminated with connector hardware. Specifically, the mode-conditioning patch cord is composed of a single-mode optical fiber permanently coupled off-center (see Offset in Figure 11-4) to a graded-index multimode optical fiber. Figure 11-4 shows a diagram of the mode-conditioning patch cord assembly.

*Figure 11-4 Mode-Conditioning Patch Cord Assembly for a GBIC Module*




| | | | |
|---|---|---|---|
| **1** | Beige color identifier | **6** | Multimode fiber |
| **2** | To Gigabit Ethernet interface | **7** | Single-mode fiber |
| **3** | RX | **8** | Offset |
| **4** | TX | **9** | To cable plant |
| **5** | Blue color identifier | | |

Go to Chapter 16, “Preparing for Installation” to begin the installation or replacement of the line card. For troubleshooting information, see Chapter 18, “Troubleshooting the Installation.”

PART 4

# Packet over SONET Line Cards

# 6-Port OC-3/STM-1 Packet over SONET Line Card Overview

This chapter describes the Cisco 10000 series 6-port OC-3/STM-1 Packet over SONET line card (referred to as the 6-port OC-3/STM-1 Packet over SONET line card), and contains the following sections:


- Line Card Summary, page 12-1
- Software and Hardware Compatibility, page 12-2
- Line Card, Router, and Processor Compatibility, page 12-2
- LEDs, page 12-3
- Physical Specifications, page 12-4
- Slot Locations, page 12-5
- Cables and Connectors, page 12-7


## Line Card Summary

*Table 12-1 6-Port Packet over SONET Line Card Summary*

| Product Number | Description | Minimum Cisco IOS Release |
|---|---|---|
| ESR-6OC3/P-SMI= | 6-port OC-3c/STM-1 POS/SDH line card | Initial Cisco IOS releases for PRE-1:<br>12.0(22)S and later releases of Cisco IOS Release12.0S<br>Initial Cisco IOS releases for PRE-2:<br>12.0(20)ST and later releases of Cisco IOS 12.0ST<br>12.0(22)S and later releases of Cisco IOS Release12.0S<br>12.2(8)BZ and later releases of Cisco IOS Release 12.2BZ<br>12.2(28)SB and later releases of Cisco IOS Release 12.2(28)SB<br>12.3(7)XI and later releases of Cisco IOS 12.3XI<br>For registered Cisco.com users, use Software Advisor to determine the software releases for this line card. |

The 6-port OC-3/STM-1 Packet over SONET line card provides 6 STS-3/STM-1 POS trunk uplinks that support throughput of up to 155.52 Mbps each over a SONET/ITU-T Synchronous Digital Hierarchy (SDH) interface. Each port (0 to 5) has a single-mode optical fiber intermediate-reach LC connector.

If you are a registered Cisco.com user, see Feature Navigator for supported features.

# Software and Hardware Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether line cards within a system are compatible, but does provide the minimum Cisco IOS requirements for individual hardware line cards, modules, or options.

**Note** Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, click **Login** at Cisco.com, type **Software Advisor** in the Search box, and click **Go**. Click the link for the Software Advisor tool.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

# Line Card, Router, and Processor Compatibility

Table 12-2 lists router model, line card, and processor compatibility.

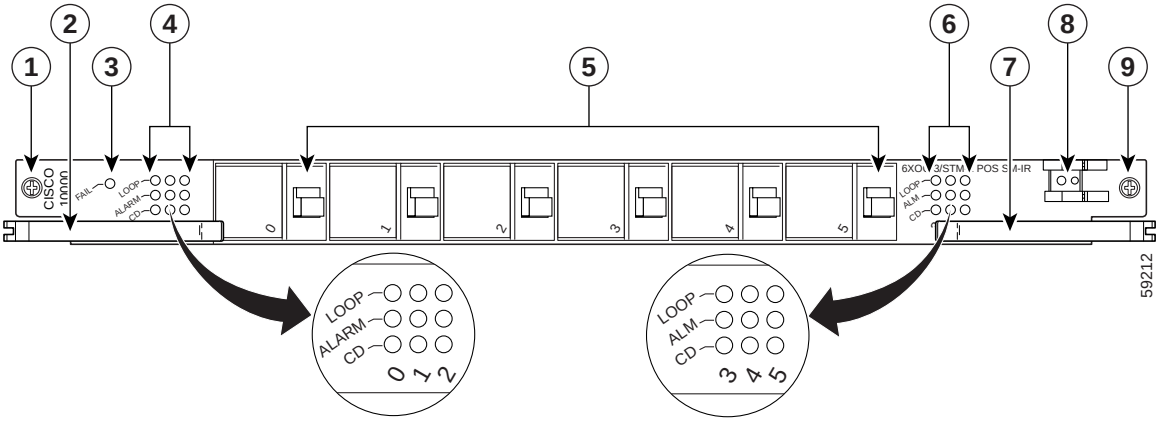
***Table 12-2 Line Card, Router, and Processor Compatibility***

| Line Card | Cisco 10008 | Cisco 10005 | PRE-2 | PRE-1 | PRE |
|---|---|---|---|---|---|
| 6-port OC-3/STM-1 Packet over SONET line card | Yes | Yes | Yes | Yes | No |

# LEDs

The 6-port OC-3/STM-1 Packet over SONET line card LEDs are shown in Figure 12-1.

***Figure 12-1 6-Port OC-3/STM-1 Packet over SONET Line Card Faceplate Description***




| | | | |
|---|---|---|---|
| **1** | Top captive screw | **6** | Ports 3 to 5 status LED group:<br>Loop, Alarm, CD (carrier detect) |
| **2** | Top ejector lever | **7** | Lower ejector lever |
| **3** | Yellow line card Fail LED | **8** | Cable-management clip |
| **4** | Ports 0 to 2 status LED group:<br>Loop, Alarm, CD (carrier detect) | **9** | Lower captive screw |
| **5** | Ports 0 to 5 RX and TX connectors | | |

Table 12-3 provides a description of the 6-port OC-3/STM-1 Packet over SONET line card LEDs.

***Table 12-3 LED Description***

| LED Label | Color | State | Meaning |
|---|---|---|---|
| Fail | Yellow | Off | Off when line card is working properly. |
| | | On | On when the line card power on self test (POST) fails. |
| Loop | Yellow | Off | Off when the line card is available for normal operation. |
| | | On | On when some portion of the corresponding port data is in a loopback state and is not available for normal operations. |
| Alarm | Yellow | Off | Off when the line card is operating normally. |
| | | On | On when an alarm condition exists at the corresponding port. |
| CD (carrier detected) | Green | On | On when a carrier is detected at the corresponding port. |
| | | Off | Off when a loss of signal (LoS) is indicated. |

# Physical Specifications

The 6-port OC-3/STM-1 Packet over SONET line card physical specifications are shown in Table 12-4.

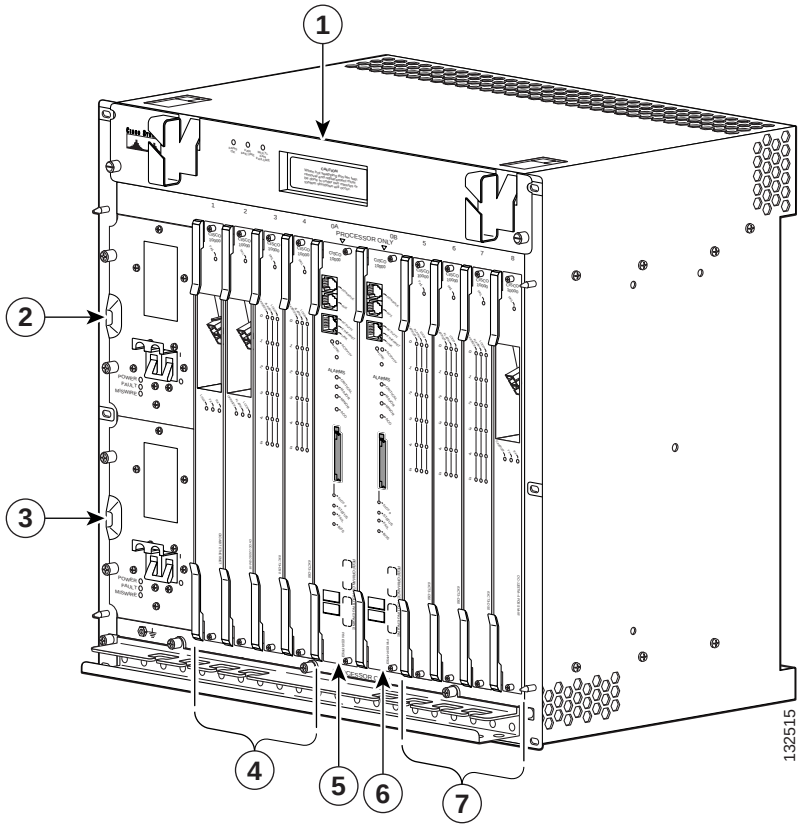
*Table 12-4 6-Port OC-3/STM-1 Packet over SONET Line Card Physical Specifications*

| Description | Specifications |
|---|---|
| Physical dimensions | Height: 16.0 in. (40.64 cm)<br>Depth: 9.97 in. (25.32 cm)<br>Width: 1.12 in. (2.83 cm) |
| Shipping weight | Approximately 4.75 lb (2.16 kg) |
| Operating temperature | 41°F to 104°F (5°C to 40°C)<br>Short-term operating temperature is limited to 131°F (55°C) in compliance with Bellcore GR |
| Relative humidity | Operating—nominal: 5% to 85%<br>Operating—short term: 5% to 90%<br>Storage: 5% to 95% |
| Storage temperature | –40°F to 158°F (–40°C to 70C °) |

# Slot Locations

The line card slot designations are shown in this section. Figure 12-2 shows line card slot designations for the Cisco 10008 router and Figure 12-3 shows line card slot designations for the Cisco 10005 router.

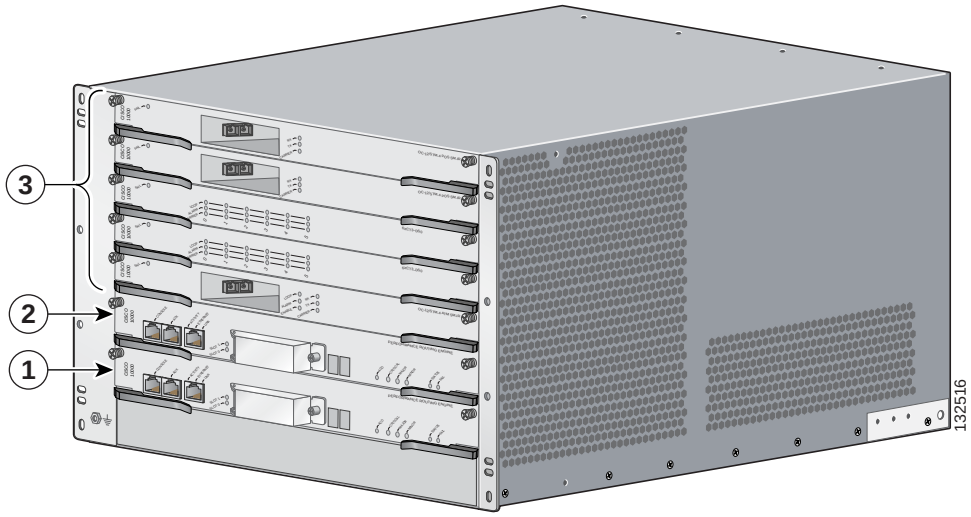
***Figure 12-2 Line Card Slot Designations for the Cisco 10008 Router***




| | | | |
|---|---|---|---|
| **1** | Blower module | **5** | PRE slot 0A |
| **2** | Primary PEM | **6** | PRE -slot 0B |
| **3** | Redundant PEM | **7** | Line card slots 5 to 8 |
| **4** | Line card slots 1 to 4 | | |

The 6-port OC-3/STM-1 Packet over SONET line card can be installed in line card slot 1 through slot 8.

*Figure 12-3 Line Card Slot Designations for the Cisco 10005 Router*




| | | | |
|---|---|---|---|
| **1** | PRE slot A | **3** | Line card slots 1 (top) to 5 (bottom) |
| **2** | PRE slot B | | |

The 6-port OC-3/STM-1 Packet over SONET line card can be installed in line card slot 1 through slot 5.

# Cables and Connectors

The 6-port OC-3/STM-1 Packet over SONET line card uses LC-type connectors.

Table 12-5 and Table 12-6 provide optical cable specifications for the 6-port OC-3/STM-1 Packet over SONET line card.

***Table 12-5 Optical Specifications***

| Transceiver Type | Transmit Power | Maximum Power to Receiver | Minimum Receiver Sensitivity | Nominal Distance Between Stations | Wavelength | Fiber Type |
|---|---|---|---|---|---|---|
| Single-mode intermediate reach | –15 dBm minimum to -8 dBm maximum | –8 dBm | –28 dBm | Up to 9 mi (15 km) | 1280 nm to 1335 nm | Single mode, core size 8 to 10 microns |

***Table 12-6 Optical Power Budget***

| Power Budget | Transmit Power | Receive Power | Typical Maximum Distance |
|---|---|---|---|
| 12 dB | –15 to -8 dBm | –28 to –8 dBm | 9.3 miles (15 km) |

Go to Chapter 16, “Preparing for Installation” to begin the installation or replacement of the line card.

For troubleshooting information, see Chapter 18, “Troubleshooting the Installation.”

# 1-Port OC-12 Packet over SONET Line Card Overview

This chapter describes the Cisco 10000 series 1-port OC-12 Packet over SONET line card (referred to as the 1-port OC-12 Packet over SONET line card), and contains the following sections:


- Line Card Summary, page 13-1
- Software and Hardware Compatibility, page 13-2
- Line Card, Router, and Processor Compatibility, page 13-2
- LEDs, page 13-3
- Physical Specifications, page 13-4
- Slot Locations, page 13-5
- Cables and Connectors, page 13-7


## Line Card Summary

*Table 13-1 1-Port OC-12 Packet over SONET Line Card Summary*

| Product Number | Description | Minimum Cisco IOS Release |
|---|---|---|
| ESR-1OC-12/P-SMI = | 1-port OC-12 Packet over SONET line card | Initial Cisco IOS releases for PRE-1:<br>12.0(22)S and later releases of Cisco IOS 12.0S<br>Initial Cisco IOS releases for PRE-2:<br>12.0(22)S and later releases of Cisco IOS 12. 0S<br>12.2(28)SB and later releases of Cisco IOS Release 12.2(28)SB<br>12.3(7)XI and later releases of Cisco IOS 12.3XI<br>For registered Cisco.com users, use Software Advisor to determine the software releases for this line card. |

The 1-port OC-12 Packet over SONET line card provides a trunk uplink that supports up to 622 Mbps throughput over a standard SONET/ITU-T Synchronous Digital Hierarchy (SDH) interface using a single-mode fiber intermediate-reach SC connector.

The 1-port OC-12 Packet over SONET line card is a standard implementation of Packet over SONET switching, and supports the following features:

- Alarm processing
- Performance monitoring

If you are a registered Cisco.com user, see Feature Navigator for supported features.

# Software and Hardware Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether line cards within a system are compatible, but does provide the minimum Cisco IOS requirements for individual hardware line cards, modules, or options.

**Note** Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, click **Login** at Cisco.com, type **Software Advisor** in the Search box, and click **Go**. Click the link for the Software Advisor tool.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

# Line Card, Router, and Processor Compatibility

Table 13-2 lists router model, line card, and processor compatibility.

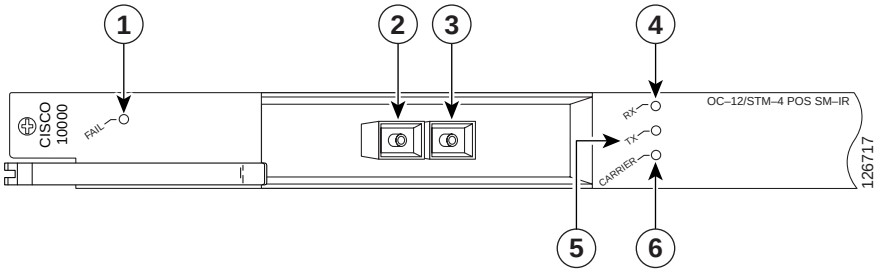
***Table 13-2 Line Card, Router, and Processor Compatibility***

| Line Card | Cisco 10008 | Cisco 10005 | PRE-2 | PRE-1 | PRE |
|---|---|---|---|---|---|
| 1-port OC-12 Packet over SONET line card | Yes | Yes | Yes | Yes | Yes |

# LEDs

The 1-port OC-12 Packet over SONET LEDs are shown in Figure 13-1.

***Figure 13-1 1-Port OC-12 Packet over SONET Line Card Faceplate Description***




| | | | |
|---|---|---|---|
| **1** | FAIL LED | **4** | RX LED |
| **2** | TX (transmit) | **5** | TX LED |
| **3** | RX (receive) | **6** | CARRIER LED |

Table 13-3 provides a description of the 1-port OC-12 Packet over SONET LEDs.

***Table 13-3 LED Description***

| LED Label | Color | State | Meaning |
|---|---|---|---|
| FAIL | Yellow | Off | A major failure has disabled the line card. |
| | | On | The line card is operating properly. |
| RX | Green | On | The port is receiving traffic. |
| | | Off | The port is not receiving traffic. |
| TX | Green | On | The port is transmitting traffic. |
| | | Off | The port is not transmitting traffic. |
| CARRIER (carrier detected) | Green | On | On when a carrier is detected at the corresponding port. |
| | | Off | Off when a carrier is not detected. |

# Physical Specifications

The 1-port OC-12 Packet over SONET line card physical specifications are shown in Table 13-4.

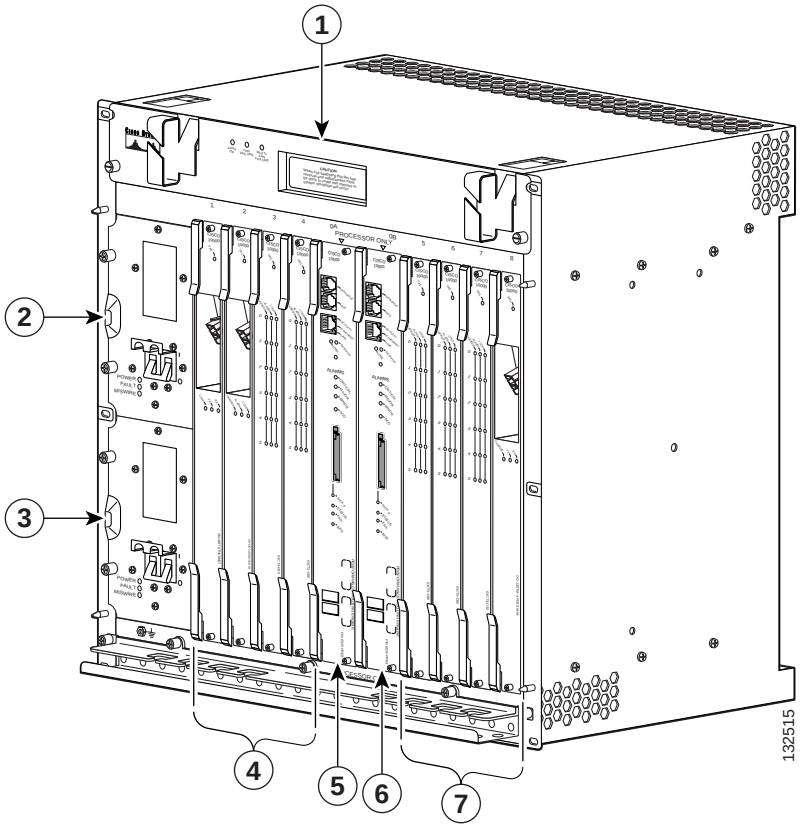
***Table 13-4 1-Port OC-12 Packet over SONET Line Card Physical Specifications***

| Description | Specifications |
|---|---|
| Physical dimensions | Height: 16.0 in. (40.64 cm)<br>Depth: 9.97 in. (25.32 cm)<br>Width: 1.12 in. (2.83 cm) |
| Shipping weight | Approximately 4.75 lb (2.16 kg) |
| Operating temperature | 41°F to 104°F (5°C to 40°C)<br>Short-term operating temperature is limited to 131°F (55°C) in compliance with Bellcore GR |
| Relative humidity | Operating—nominal: 5% to 85%<br>Operating—short term: 5% to 90%<br>Storage: 5% to 95% |
| Storage temperature | –40°F to 158°F (–40°C to 70C °) |

# Slot Locations

The line card slot designations are shown in this section. See Figure 13-2 for line card slot designations for the Cisco 10008 router and Figure 13-3 for line card slot designations for the Cisco 10005 router.

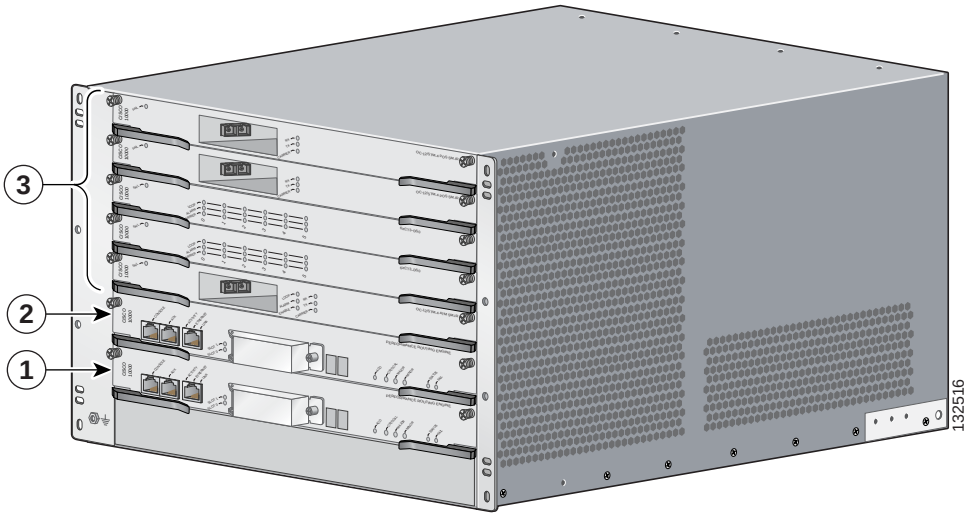
***Figure 13-2 Line Card Slot and Subslot Designations for the Cisco 10008 Router***




| | | | |
|---|---|---|---|
| **1** | Blower module | **5** | PRE slot 0A |
| **2** | Primary PEM | **6** | PRE slot 0B |
| **3** | Redundant PEM | **7** | Line card slots 5 to 8 |
| **4** | Line card slots 1 to 4 | | |

The 1-port OC-12 Packet over SONET line card can be installed in slot 1 through slot 8.

*Figure 13-3 Line Card Slot Designations for the Cisco 10005 Router*




| | | | |
|---|---|---|---|
| **1** | PRE slot A | **3** | Line card slots 1 (top) to 5 (bottom) |
| **2** | PRE slot B | | |

The 1-port OC-12 Packet over SONET line card can be installed in slot 1 through slot 5.

# Cables and Connectors

The 1-port OC-12 Packet over SONET line card uses an SC-type optical connector.

Table 13-5 and Table 13-6 provide optical cabling specifications for the 1-port OC-12 Packet over SONET line card.

***Table 13-5 Optical Specifications***

| Transceiver Type | Transmit Power | Maximum Power to Receiver | Minimum Receiver Sensitivity | Nominal Distance Between Stations | Wavelength | Fiber Type |
|---|---|---|---|---|---|---|
| Single-mode intermediate reach | –15 dBm minimum to -8 dBm maximum | –8 dBm | –28 dBm | Up to 9 mi (15 km) | 1280 nm to 335 nm | Single mode, core size 8 to 10 microns |

***Table 13-6 Optical Power Budget***

| Power Budget | Transmit Power | Receive Power | Typical Span |
|---|---|---|---|
| 12 dB | –15 to -8 dBm | –28 to –8 dBm | 9.3 miles (1.5 km) |

Go to Chapter 16, “Preparing for Installation” to begin the installation or replacement of the line card.

For troubleshooting information, see Chapter 18, “Troubleshooting the Installation.”

# 1-Port OC-48/STM-16 Packet over SONET Line Card Overview

This chapter describes the Cisco 10000 series 1-port OC-48/STM-16 Packet over SONET line card (referred to as the 1-port OC-48/STM-16 Packet over SONET line card), and contains the following sections:


- Line Card Summary, page 14-1
- Software and Hardware Compatibility, page 14-2
- Line Card, Router, and Processor Compatibility, page 14-3
- LEDs, page 14-3
- Physical Specifications, page 14-5
- Slot Locations, page 14-6
- Cables and Connectors, page 14-7


## Line Card Summary

*Table 14-1 1-Port OC-48/STM-16 Packet over SONET Line Card Summary*

| Product Number | Description | Minimum Cisco IOS Release |
|---|---|---|
| ESR1OC48/P/SRPSMS= | 1-port OC-48/STM-16 POS/SRP, single-mode, short-reach line card | Initial Cisco IOS releases for PRE-2:<br>12.2(15)BX and later releases<br>12.2(28)SB and later releases of Cisco IOS Release 12.2(28)SB |
| ESR1OC48/P/SRPSML= | 1-port OC-48/STM-16 POS/SRP, single-mode, long-reach line card | 12.2BX<br>12.2(28)SB and later releases of Cisco IOS Release 12.2(28)SB<br>12.3(7)XI and later releases of Cisco IOS 12.3XI<br>For registered Cisco.com users, use Software Advisor to determine the software releases for this line card. |

The 1-port OC-48/STM-16 Packet over SONET line card provides a trunk uplink capable of supporting up to 2.4 Gbps full duplex throughput over a standard SONET/ITU-T Synchronous Digital Hierarchy (SDH) interface, using a single-mode fiber with SC connectors.

Figure 14-1 shows the front panel of the OC-48/STM-16 Packet over SONET line card.

The 1-port OC-48/STM-16 Packet over SONET line card provides a point-to-point connection to a backbone router and encapsulates IP packets with byte-wise HDLC framing, placing them directly into the OC-48 SONET (or SDH) payload.

The 1-port OC-48/STM-16 Packet over SONET line card is a standard implementation of Packet over SONET switching, and supports the following features:

- OC-48 bandwidth between the line card and the Performance Routing Engine (PRE)
- North American (SONET) and European (SDH) formats
- Automatic protection switching (APS)
- Alarm processing
- Performance monitoring
- IP over DCC (Data Communications Protocol) for remote management of the Cisco 15104 OC-48/STM16 Optical Regenerator, where applicable

If you are a registered Cisco.com user, see Feature Navigator for supported features.

# Software and Hardware Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether line cards within a system are compatible, but does provide the minimum Cisco IOS requirements for individual hardware line cards, modules, or options.

**Note** Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, click **Login** at Cisco.com, type Software Advisor in the Search box, and click **Go**. Click the link for the Software Advisor tool.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

# Line Card, Router, and Processor Compatibility

Table 14-2 lists the router model, line card, and processor compatibility.

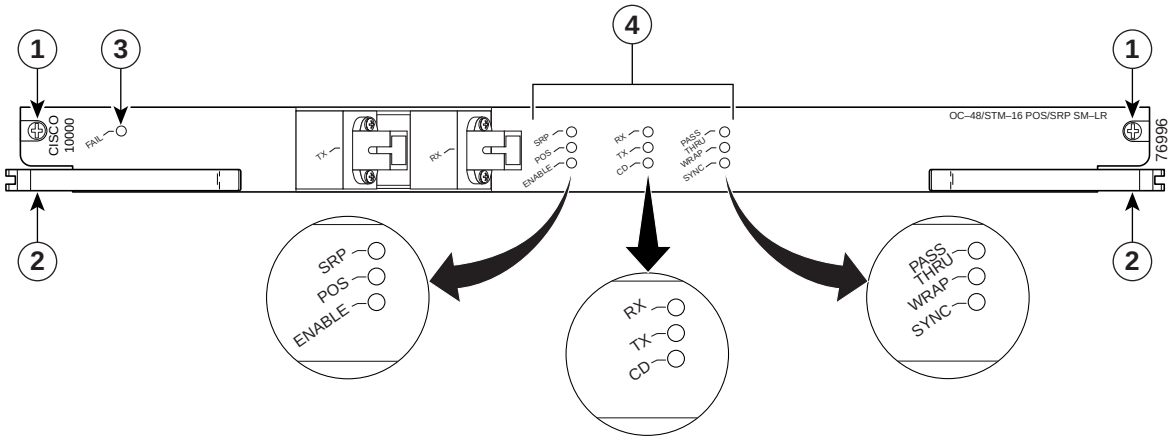
***Table 14-2 Line Card, Router, and Processor Compatibility***

| Line Card | Cisco 10008 | Cisco 10005 | PRE-2 | PRE-1 | PRE |
|---|---|---|---|---|---|
| 1-port OC-48/STM-16 Packet over SONET line card ESROC48/P/SRPSMS= | Yes | No | Yes | No | No |
| 1-port OC-48/STM-16 Packet over SONET l line card ESROC48/P/SRPSML= | Yes | No | Yes | No | No |

# LEDs

The 1-port OC-48/STM-16 Packet over SONET line card LEDs are shown in Figure 14-1.

***Figure 14-1 1-Port OC-48/STM-16 Packet over SONET Line Card Faceplate Description***




| | | | |
|---|---|---|---|
| 1 | Captive screw | 3 | FAIL LED |
| 2 | Ejector lever | 4 | Port status LEDs:<br>SRP, POS, ENABLE<br>RX, TX, CD (carrier detect)<br>PASS THRU, WRAP, SYNC |

Table 14-3 provides a description of the 1-port OC-48/STM-16 Packet over SONET line card LEDs.

***Table 14-3 LED Description***

| LED Label | Color | State | Meaning |
|---|---|---|---|
| FAIL | Yellow | Off | The line card is operating properly. |
| | | On | A major failure has disabled the line card. |

*Table 14-3 LED Description (continued)*

| LED Label | Color | State | Meaning |
|---|---|---|---|
| SRP | Green | Off | SRP is not supported on the OC-48/STM-16 Packet over SONET line card when it is installed in the Cisco 10000 chassis. |
| POS | Green | On | The line card is operating in POS mode. |
| | | Off | The line card is not operating in POS mode. |
| ENABLE | Green | On | The line card is enabled (administratively up) and operational. |
| | | Off | The line card is disabled (administratively down) or the card is not operational. |
| RX | Green | On | The port is receiving traffic. |
| | | Off | The port is not receiving traffic. |
| TX | Green | On | The port is transmitting traffic. |
| | | Off | The port is not transmitting traffic. |
| CD (carrier detected) | Green | On | On when a carrier is detected at the corresponding port. |
| | | Off | Off when no carrier is detected. |
| PASS THRU | — | Off | An SRP indicator that is not supported on the OC-48/STM-16 Packet over SONET line card when it is installed in the Cisco 10000 chassis. |
| WRAP | — | Off | An SRP indicator that is not supported on the OC-48/STM-16 Packet over SONET line card when it is installed in the Cisco 10000 chassis. |
| SYNC | — | Off | An SRP indicator that is not supported on the OC-48/STM-16 Packet over SONET line card when it is installed in the Cisco 10000 chassis. |

# Physical Specifications

The 1-port OC-48/STM-16 Packet over SONET line card physical specifications appear in Table 14-4.

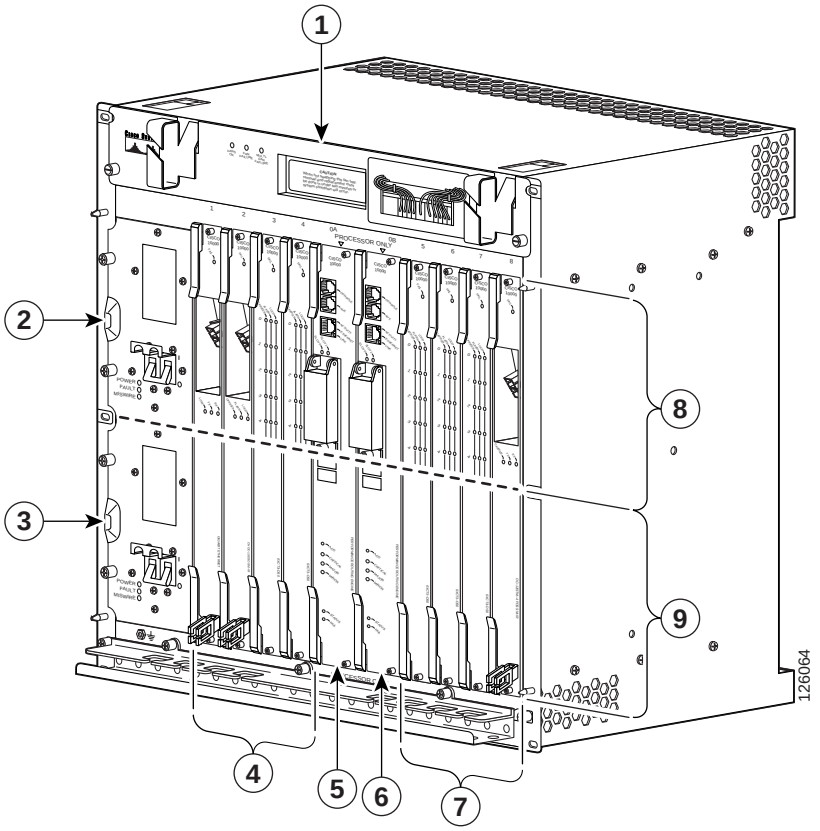
*Table 14-4 1-Port OC-48/STM-16 Packet over SONET Line Card Physical Specifications*

| Description | Specifications |
|---|---|
| Physical dimensions | Height: 16.0 in. (40.64 cm)<br>Depth: 9.97 in. (25.32 cm)<br>Width: 1.12 in. (2.83 cm) |
| Shipping weight | Approximately 4.75 lb (2.16 kg) |
| Operating temperature | 41°F to 104°F (5°C to 40°C)<br>Short-term operating temperature is limited to 131°F (55°C) in compliance with Bellcore GR |
| Relative humidity | Operating—nominal: 5% to 85%<br>Operating—short term: 5% to 90%<br>Storage: 5% to 95% |
| Storage temperature | –40°F to 158°F (–40°C to 70C °) |

# Slot Locations

The line card slot designations are shown in Figure 14-2.

***Figure 14-2 Line Card Slot and Subslot Designations for the Cisco 10008 Router***




| | | | |
|---|---|---|---|
| **1** | Blower module | **6** | PRE slot 0B |
| **2** | Primary PEM | **7** | Line card slots 5 to 8 |
| **3** | Redundant PEM | **8** | Subslot 0 |
| **4** | Line card slots 1 to 4 | **9** | Subslot 1 |
| **5** | PRE slot 0A | | |

The 1-port OC-48/STM-16 Packet over SONET line card can be installed in slot 1 through slot 8.

# Cables and Connectors

The1-port OC-48/STM-16 Packet over SONET line card uses a single- mode fiber-optic cable with SC-type connectors.

**Warning** **The long reach version of the 1-port OC-48/STM-16 Packet over SONET line card (product number ESR1OC48/P/SRP-SML) requires a minimum optical attenuation to avoid irreversible damage to the receiver.**

Table 14-5 lists optical cabling specifications for the 1-port OC-48/STM-16 Packet over SONET line card.

***Table 14-5 Optical Specifications***

| Transceiver Type | Transmit Power | Maximum Power to Receiver | Minimum Receiver Sensitivity | Nominal Distance Between Stations | Wavelength | Fiber Type |
|---|---|---|---|---|---|---|
| OC-48 POS short reach | –10 dBm minimum to –3 dBm maximum | –3 dBm | –18 dBm | Up to 1.24 mi (2 km) | 1266 nm to 1360 nm | Single mode, core size 8 to 10 microns |
| OC-48 POS long reach 2 (LR2) | –2 dBm minimum to +3 dBm maximum | –9 dBm[1] | –28 dBm | Up to 50 mi (80 km) | 1500 nm to 1580 nm | Single mode, core size 8 to 10 microns |

1. For LR2, a minimum of 12 dB of total attenuation between transmitter and receiver is required. Exceeding the maximum receive power can damage the optics.

Go to Chapter 16, “Preparing for Installation” to begin the installation or replacement of the line card.

For troubleshooting information, see Chapter 18, “Troubleshooting the Installation.”

PART 5

# E3/T3 Unchannelized Line Card

# 8-Port Unchannelized E3/T3 Line Card Overview

This chapter describes the Cisco 10000 series 8-port unchannelized E3/T3 line card (referred to as the 8-port unchannelized E3/T3 line card), and contains the following sections:


- Line Card Summary, page 15-1
- Software and Hardware Compatibility, page 15-2
- Line Card, Router, and Processor Compatibility, page 15-2
- LEDs, page 15-3
- Physical Specifications, page 15-4
- Slot Locations, page 15-5
- Cables and Connectors, page 15-7


## Line Card Summary

*Table 15-1 8-Port Unchannelized E3/T3 Line Card Summary*

| Product Number | Description | Minimum Cisco IOS Release |
|---|---|---|
| ESR-8E3/DS3= | 8-port unchannelized E3/T3 line card | Initial Cisco IOS releases for PRE-1:<br>12.0(22)S and later releases of Cisco IOS 12.0S<br><br>Initial Cisco IOS releases for PRE-2:<br>12.0(22)S and later releases of Cisco IOS 12.0S<br>12.0(20)ST and later releases of<br>12.0ST<br>12.3(7)XI and later releases of Cisco IOS 12.3XI<br><br>For registered Cisco.com users, use Software Advisor to determine the software releases for this line card. |

In unchannelized (also called *clear channel*) operation, each E3/T3 interface port provides a single high-speed data channel. Each port can be configured to use any portion of the E3/T3 available bandwidths. The maximum E3 bandwidth is 34.386 Mbps; the maximum T3 bandwidth is 44.736 Mbps.

The line card provides Cisco 10000 series routers with eight E3 or T3 high-density unchannelized interface ports. The line card:

- Supports eight multiport T3 or E3 copper interface terminations
- Provides a solution for service providers if a fiber interface is unavailable
- Provides Internet service providers with the means to interface with existing copper Internet Protocol (IP) leased-lines
- Supports the High-Level Data Link Control (HDLC), Frame Relay, and Point-to-Point Protocol (PPP) encapsulations

If you are a registered Cisco.com user, see Feature Navigator for supported features.

# Software and Hardware Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether line cards within a system are compatible, but does provide the minimum Cisco IOS requirements for individual hardware line cards, modules, or options.

**Note** Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, click **Login** at Cisco.com, type **Software Advisor** in the SEARCH box, and click **Go**. Click the link for the Software Advisor tool.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

# Line Card, Router, and Processor Compatibility

Table 15-2 lists router model, line card, and processor compatibility.

***Table 15-2 Line Card, Router, and Processor Compatibility***

| Line Card | Cisco 10008 | Cisco 10005 | PRE-2 | PRE-1 | PRE |
|---|---|---|---|---|---|
| 8-port unchannelized E3/T3 line card | Yes | Yes | Yes | Yes | No |

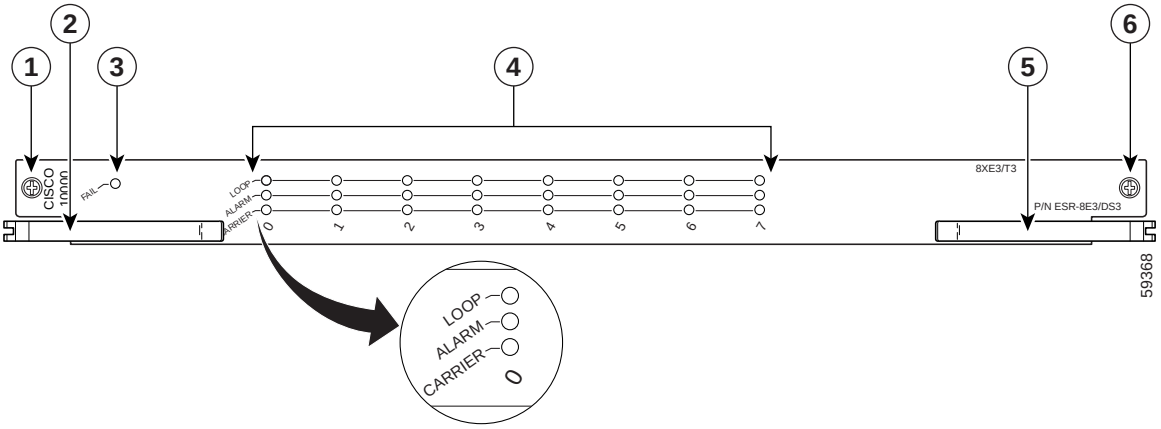
**Note** The 8-port unchannelized E3/T3 line card has been compliance-tested to function in a Cisco 10005 chassis.

**Note** If you are using the8-port unchannelized E3/T3 line card with a Cisco 10005 router, you must use the Cisco 10005 extender card. See Appendix A, “Cisco 10005 Extender Card Information” for more information on the extender card.

# LEDs

The 8-port unchannelized E3/T3 line card LEDs are shown in Figure 15-1.

***Figure 15-1 8-Port Unchannelized E3/T3 Line Card Faceplate Description***




| | | | |
|---|---|---|---|
| **1** | Captive screws | **4** | Ports 0 to 7 status LEDs |
| **2** | Top ejector lever | **5** | Bottom ejector lever |
| **3** | FAIL LED | **6** | Bottom captive screw |

Table 15-3 provides a description of the 8-port unchannelized E3/T3 line card LEDs.

***Table 15-3 LED Description***

| LED Label | Color | State | Meaning |
|---|---|---|---|
| FAIL | Yellow | Off | Off when line card is working properly. Turns on for a few seconds during line card power-on self test (POST), then turns off when the line card is working properly.<br>Off if the card power supply fails.<br>Off if the card 48V fuse is blown.<br>On when the line card POST fails. |
| | | On | On if a failure occurs. |
| | | Blinking | Blinking under certain POST failures. |
| LOOP | Yellow | Off | Off when the line card is available for normal operation. |
| | | On | On when some portion of the corresponding port data is in a loopback state and is not available for normal operations. |
| ALARM | Yellow | Off | Off when the line card is operating normally. |
| | | On | On when an alarm condition exists at the corresponding port. |

*Table 15-3 LED Description (continued)*

| LED Label | Color | State | Meaning |
|---|---|---|---|
| CARRIER (carrier detected) | Green | On | On when a carrier is detected at the corresponding port and the interface is operating properly. |
| | | Off | Off when a loss of signal (LOS) is indicated. |

# Physical Specifications

The 8-port unchannelized E3/T3 line card physical specifications are shown in Table 15-4.

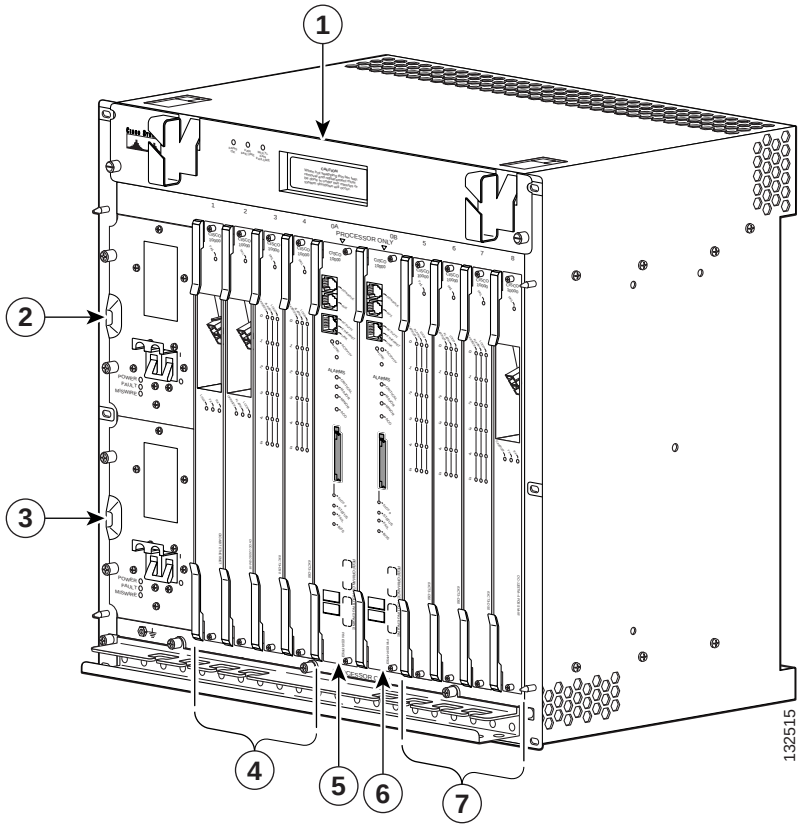
*Table 15-4 8-Port Unchannelized E3/T3 Line Card Physical Specifications*

| Description | Specifications |
|---|---|
| Physical dimensions | Height: 16.0 in. (40.64 cm)<br>Depth: 9.97 in. (25.32 cm)<br>Width: 1.12 in. (2.83 cm) |
| Shipping weight | Approximately 4.75 lb (2.16 kg) |
| Operating temperature | 41°F to 104°F (5°C to 40°C)<br>Short-term operating temperature is limited to 131°F (55°C) in compliance with Bellcore GR |
| Relative humidity | Operating—nominal: 5% to 85%<br>Operating—short term: 5% to 90%<br>Storage: 5% to 95% |
| Storage temperature | –40°F to 158°F (–40°C to 70 C°) |

# Slot Locations

The line card slot designations are shown in this section. See Figure 15-2 for line card slot designations for the Cisco 10008 router and Figure 15-3 for line card slot designations for the Cisco 10005 router.

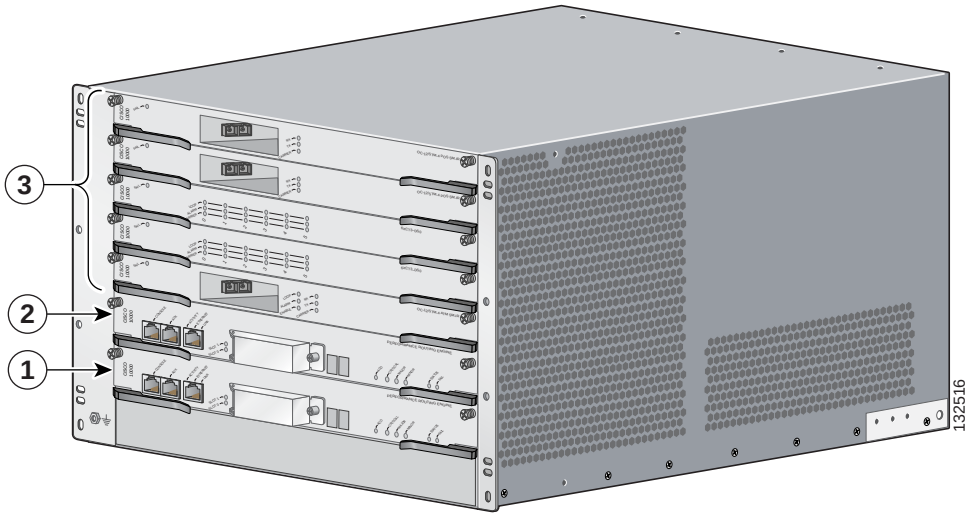
***Figure 15-2 Line Card Slot Designations—Cisco 10008 Router***




| | | | |
|---|---|---|---|
| **1** | Blower module | **5** | PRE slot 0A |
| **2** | Primary PEM | **6** | PRE slot 0B |
| **3** | Redundant PEM | **7** | Line card slots 5 to 8 |
| **4** | Line card slots 1 to 4 | | |

The 8-port unchannelized E3/T3 line card can be installed in slot 1 through slot 8.

*Figure 15-3 Line Card Slot Designations—Cisco 10005 Router*



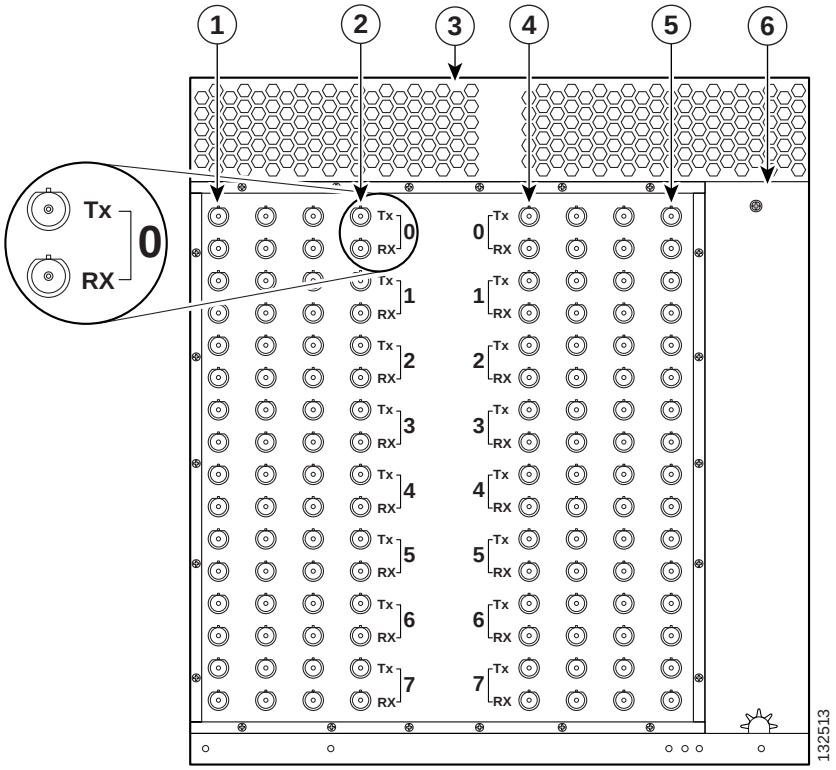

| | | | |
|---|---|---|---|
| **1** | PRE slot A | **3** | Line card slots 1 (top) to 5 (bottom) |
| **2** | PRE slot B | | |

The 8-port unchannelized E3/T3 line card can be installed in slot 1 through slot 5.

# Cables and Connectors

External network connections to the 8-port unchannelized E3/T3 line card are made through the BNC connectors mounted on the rear of the Cisco 10000 chassis, using 75-ohm coaxial cable (Figure 15-4). The approved cables for use with the 8-port unchannelized E3/T3 line card are cables conforming to WECO standards 728A, 734A, or 734D. Use cable lengths up to 450 ft (137.16 m). 735A cables can be used with lengths up to 225 ft (68.58 m).

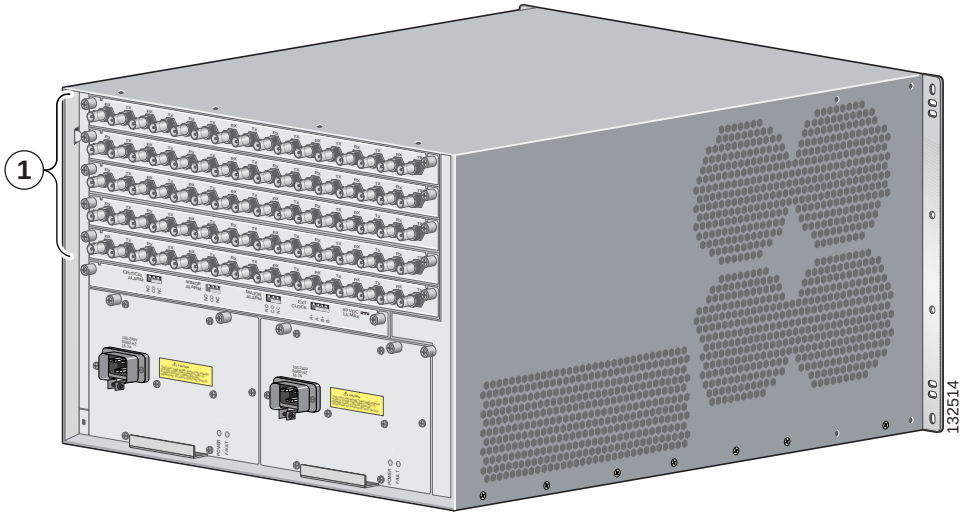
***Figure 15-4 Cisco 10008 Chassis (Rear)—BNC Connectors***




| | | | |
|---|---|---|---|
| **1** | Line card slot 8 | **4** | Line card slot 4 |
| **2** | Line cards slot 5 | **5** | Line card slot 1 |
| **3** | Blower module | **6** | Power supply |

The BNC connectors on the rear of the chassis, which use coaxial cable, are used with the 8-port unchannelized E3/T3 line card (Figure 15-5).

***Figure 15-5 Cisco 10005 Chassis (Rear)—BNC Connectors***




| | | |
|---|---|---|
| **1** | Line card slots 1 (top) to 5 (bottom) | |

Also see Appendix A, “Cisco 10005 Extender Card Information” for information about the extender card which must be used with the 8-port unchannelized E3/T3 line card in the Cisco 10005 chassis.

All Cisco 10005 cards connect to a backplane in the center of the chassis, and require extender cards to deliver the alarm, BITS clock, and DS3 signals to the rear of the chassis to make them accessible. The Cisco 10005 alarm extender card and T3/E3 extender card extend and terminate these signals.

Go to Chapter 16, “Preparing for Installation” to begin the installation or replacement of the line card.

For troubleshooting information, see Chapter 18, “Troubleshooting the Installation.”

# PART 6

# Installation

# Preparing for Installation

This chapter describes the general equipment, safety, and site preparation requirements for installing line cards on the Cisco 10000 series routers. This chapter contains the following sections:


- Required Tools and Equipment, page 16-1
- Safety Guidelines, page 16-1


## Required Tools and Equipment

You need the following equipment to install line cards. If you need additional equipment, contact a service representative for ordering information.

- Half-height or full size line card
- Carrier, if you are installing a half-height line card
- 3/16-inch flat-blade screwdriver
- Number 2 Phillips screwdriver
- Your own electrostatic discharge (ESD)-prevention equipment or a disposable grounding wrist strap
- Antistatic mat
- Antistatic container
- A terminal console connected to the PRE to configure the line card after it is installed

**Note** If your Cisco 10005 line card uses BNC connectors and coaxial cable, see Appendix A, "Cisco 10005 Extender Card Information" for installation requirements for the required extender card.

## Safety Guidelines

Read the safety guidelines in this section and review the electrical safety and ESD-prevention guidelines in the *Regulatory Compliance and Safety Information for the Cisco 10000 Series Routers* document.

This section provides safety guidelines that you should follow when working with any equipment that connects to electrical power or telephone wiring.

# Safety Warnings

Safety warnings appear throughout this publication in procedures, that, if performed incorrectly, might harm you. A warning symbol precedes each warning statement.

**Warning** **IMPORTANT SAFETY INSTRUCTIONS**

**This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device.** Statement 1071

**SAVE THESE INSTRUCTIONS**

**Note** If you need translations of the safety warning, see the *Cisco 10008 Router Hardware Installation Guide* or the *Cisco 10005 ESR Hardware Installation Guide*.

# Electrical Equipment Guidelines

Follow these basic guidelines when working with any electrical equipment:

- Before beginning any procedures requiring access to the chassis interior, locate the emergency power-off switch for the room in which you are working.
- Disconnect all power and external cables before moving a chassis.
- Do not work alone when potentially hazardous conditions exist.
- Never assume that power has been disconnected from a circuit; always check.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe; carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

# Telephone Wiring Guidelines

Use the following guidelines when working with any equipment that is connected to telephone wiring or to other network cabling:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

# Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. Line cards comprise printed circuit boards that are fixed in metal carriers. Electromagnetic interference (EMI) shielding and connectors are integral components of the carrier. Although the metal carrier helps to protect the board from ESD, use a preventive antistatic strap during handling.

Following are guidelines for preventing ESD damage:

- Always use an ESD wrist or ankle strap and ensure that it makes good skin contact.
- Connect the equipment end of the strap to an unfinished chassis surface.
- When installing a component, use any available ejector levers or captive installation screws to properly seat the bus connectors in the backplane or midplane. These devices prevent accidental removal, provide proper grounding for the system, and help to ensure that bus connectors are properly seated.
- When removing a component, use any available ejector levers or captive installation screws to release the bus connectors from the backplane or midplane.
- Handle carriers by available handles or edges only; avoid touching the printed circuit boards or connectors.
- Place a removed board component-side-up on an antistatic surface or in a static shielding container. If you plan to return the component to the factory, immediately place it in a static shielding container.
- Avoid contact between the printed circuit boards and clothing. The wrist strap only protects components from ESD voltages on the body; ESD voltages on clothing can still cause damage.
- Never attempt to remove the printed circuit board from the metal carrier.

**Caution** For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohms (Mohms).

**Caution** To avoid erroneous failure messages, remove or insert only one line card at a time. Also, after you insert or remove a line card, allow at least 60 seconds before you insert or remove another line card so that the system can reinitialize and note the current configuration of all interfaces.

**Caution** To prevent electrostatic discharge (ESD) damage, handle line cards by the faceplate or the card carrier edges only. Avoid touching the line card printed circuit board, components, or any connector pins.

# Laser/LED Safety

Any single-mode transmitters in the modules use a small laser to transmit the light signals to the network. Keep the dust cover installed whenever a cable is not connected to it. Although multimode transceivers typically use LEDs for transmission, it is good practice to keep open ports covered and avoid staring into open ports or apertures. The single-mode aperture port contains a Class 1 laser warning label, as shown in Figure 16-1.

*Figure 16-1 Laser Warning Labels for Single-Mode Port*

**Warning** **Class 1 laser product.** Statement 1008

**Warning** **Avoid eye or skin exposure to direct or scattered radiation.** Statement 1013

**Warning** **Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.** Statement 1051

The multimode aperture contains a Class 1 LED warning label, as shown in Figure 16-2.

*Figure 16-2 Class 1 LED Warning Label for Multimode Port*

**Warning** **Class 1 LED product.** Statement 1027

# Installing and Removing Line Cards

This chapter provides information about line cards and describes how to install or remove line cards on the Cisco 10005 and Cisco 10008 routers. This chapter contains the following sections:


- Handling Line Cards, page 17-1
- Online Insertion and Removal, page 17-2
- Preprovisioning Line Card Slots, page 17-3
- Slot and Subslot Locations, page 17-3
- Removing the Cisco 10008 Front Cover, page 17-8
- Installing Full-Size Line Cards, page 17-10
- Installing Half-Height Line Cards, page 17-16
- Installing SFP Modules or GBIC Modules, page 17-26
- Attaching Cables, page 17-32
- Removing an SFP Module or GBIC Module, page 17-43
- Removing Full-Size Line Cards, page 17-46
- Removing Half-Height Line Cards and Carrier, page 17-51
- Checking the Installation, page 17-58
- Configuring a Line Card, page 17-60

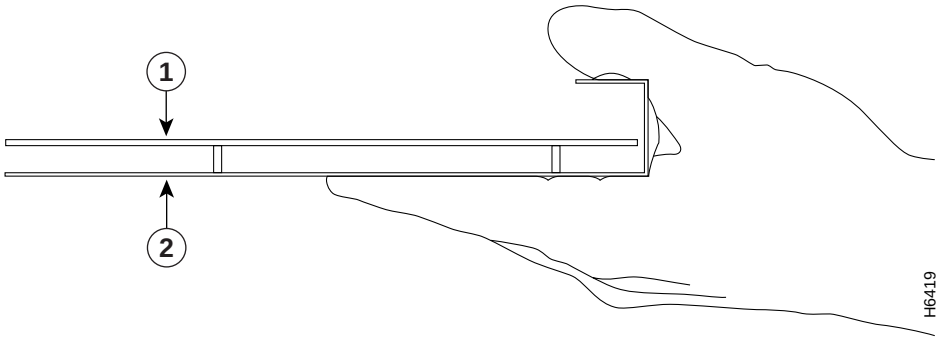

## Handling Line Cards

Each line card circuit board is mounted to a metal carrier and is sensitive to electrostatic discharge (ESD) damage. Before you begin installation, read the "Required Tools and Equipment" section on page 16-1 in Chapter 16, "Preparing for Installation" for a list of parts and tools required for installation.

Figure 17-1 shows how to hold the line card properly.

**Caution** Always handle the line card by the carrier edges and handle; never touch the line card components or connector pins.

*Figure 17-1 Handling a Line Card*




| | | | |
|---|---|---|---|
| **1** | Printed circuit board | **2** | Metal carrier |

When a slot is not in use, a blank faceplate must fill the empty slot to allow the router or switch to conform to electromagnetic interference (EMI) emissions requirements and to allow proper airflow across the installed modules. If you plan to install a line card in a slot that is not in use, you must first remove the blank faceplate.

**Caution** Do not install two blank faceplates into a carrier. Instead, install a full-slot blank faceplate into the slot. The half-height blank faceplates do not have air dams, and the empty slot will rob cooling air from the other slots. A carrier with one half-height line card and one blank faceplate is allowed.

# Online Insertion and Removal

All line cards in the Cisco 10000 series routers support online insertion and removal (OIR). However, it is wise to shut down the interface before removing a line card that has active traffic moving through it. Removing a line card while traffic is flowing through the ports can cause system disruption. Once the line card is inserted, the ports can be brought back up.

If you remove and replace the line card in the same slot, the system automatically downloads the necessary configuration information from the Performance Routing Engine (PRE); you do not need to configure the new line card. After the software downloads the information, the system recognizes only those interfaces that match the previous line card configuration (configured as *up*).

**Note** As you disengage the line card from the router, online insertion and removal (OIR) administratively shuts down all active interfaces on the line card.

OIR allows you to install and replace line cards while the router is operating; you do not need to notify the software or shut down the system power, although you should not run traffic through the line card you are removing while it is being removed. OIR is a method that is seamless to end users on the network and maintains all routing information.

**Caution** Finish removing and replacing a line card before removing another line card.

# Preprovisioning Line Card Slots

Before you install a line card, you might want to preprovision the line card slot.

Preprovisioning a line card slot downloads software to the line card slot for the line card you are planning to install. Preprovisioning allows you to prepare in advance a complete configuration for the line card, including items you normally need to configure after initially configuring the line card, such as PVCs under an ATM line card or VLANs under an Ethernet line card.

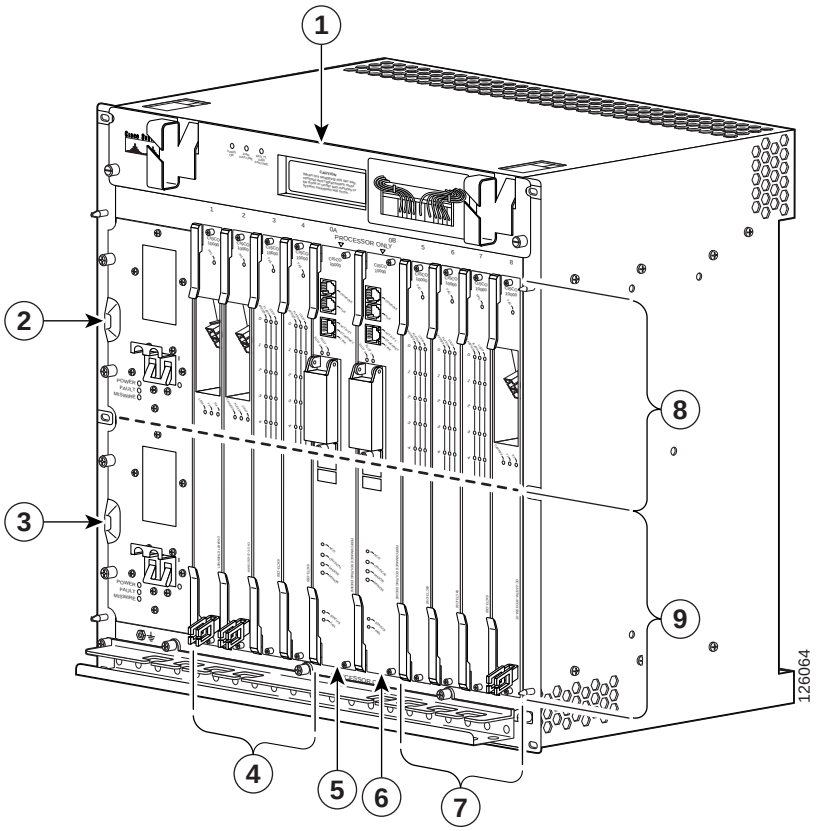
Resetting a line card reloads line card software without having to manually insert and remove the line card.

See the *Cisco 10000 Series Router Line Card Configuration Guide* for more information on preprovisioning line card slots and resetting line card slots.

# Slot and Subslot Locations

Figure 17-2 and Figure 17-3 show line card and half-height line card slot and subslot locations on the Cisco 10008 router and the Cisco 10005 router.

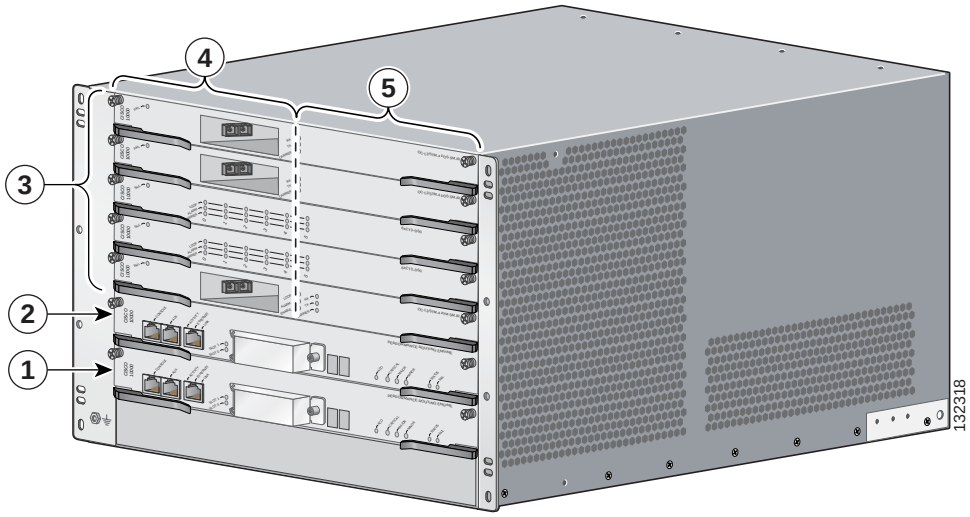
*Figure 17-2 Line Card Slots and Subslots—Cisco 10008 Router*




| | | | |
|---|---|---|---|
| **1** | Blower module | **6** | PRE slot 0B |
| **2** | Primary PEM | **7** | Line card slots 5 to 8 |
| **3** | Redundant PEM | **8** | Subslot 0 |
| **4** | Line card slots 1 to 4 | **9** | Subslot 1 |
| **5** | PRE slot 0A | | |

The Cisco 10000 line cards can be installed in slot 1 through slot 8. Cisco 10000 half-height line cards can be installed in subslot 0 or subslot 1 of slot 1 through slot 8 using a carrier.

*Figure 17-3 Line Card Slots and Subslots—Cisco 10005 Router*

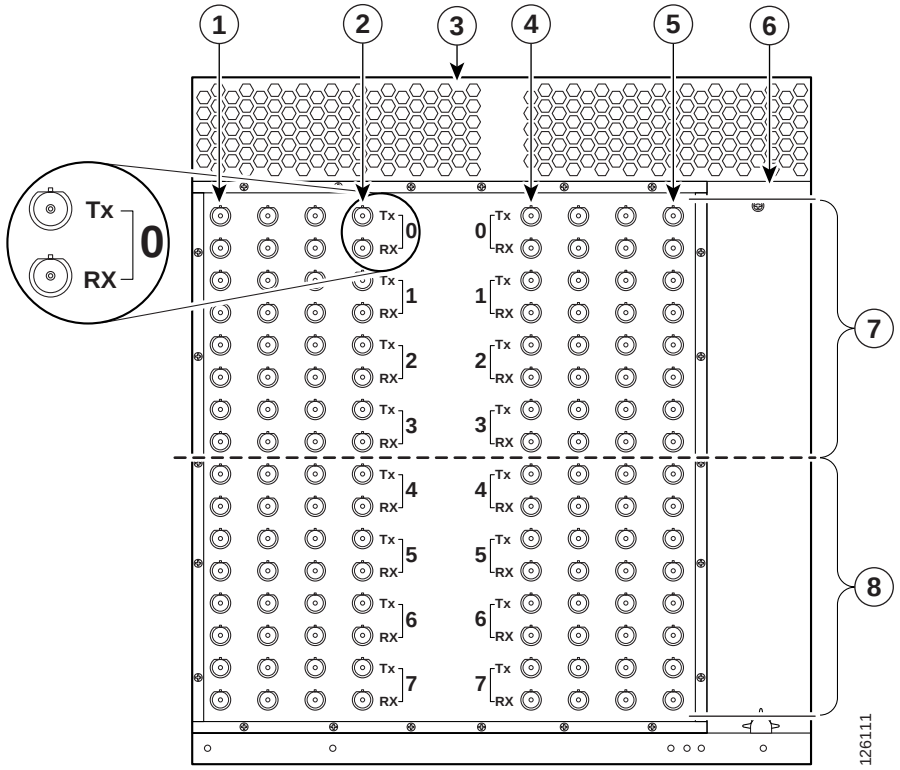



| | | | |
|---|---|---|---|
| **1** | PRE slot A | **4** | Subslots 1/0 (top) to 5/0 (bottom) |
| **2** | PRE slot B | **5** | Subslots 1/1 (top) to 5/1 (bottom) |
| **3** | Line card slots 1 (top) to 5 (bottom) | | |

The Cisco 10000 line cards can be installed in slot 1 through slot 5. Cisco 10000 half-height line cards can be installed in subslot 0 or subslot 1 of slot 1 through slot 5 using a carrier.

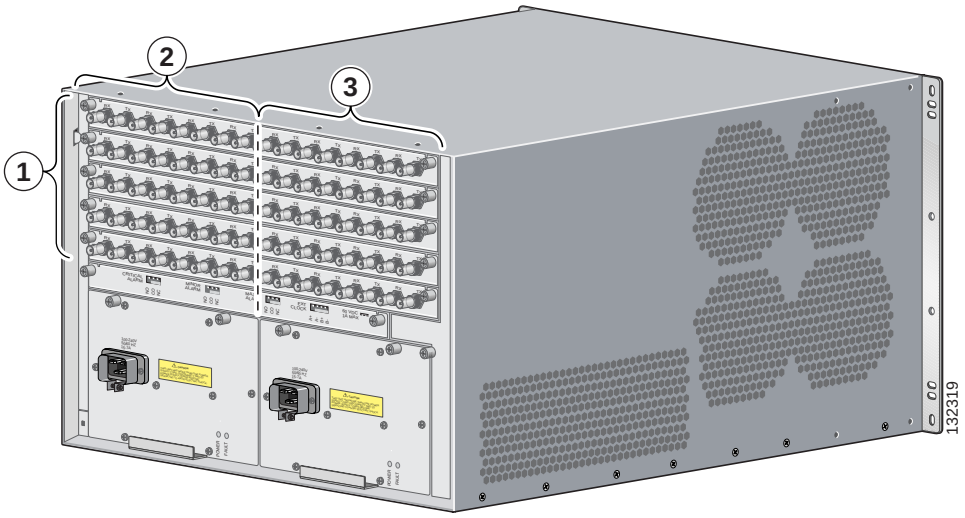
Figure 17-4 and Figure 17-5 provide illustrations of the BNC connectors and line card slots and subslots on the rear of the router.

*Figure 17-4 BNC Connectors on the Rear of the Cisco 10008 Router*




| | | | |
|---|---|---|---|
| **1** | Line card slot 8 | **5** | Line card slot 1 |
| **2** | Line card slot 5 | **6** | Power supply |
| **3** | Blower module | **7** | Half-height line card subslot 0 |
| **4** | Line card slot 4 | **8** | Half-height line card subslot 1 |

*Figure 17-5 BNC Connectors on the Rear of the Cisco 10005 Router*




| | | | |
|---|---|---|---|
| **1** | Line card slots 1 (top) to 5 (bottom) | **3** | Subslots 1/0 (top) to 5/0 (bottom) |
| **2** | Subslots 1/1 (top) to 5/1 (bottom) | | |

Also see Appendix A, "Cisco 10005 Extender Card Information" for information about the extender card which must be used with the 8-port unchannelized E3/T3 line card in the Cisco 10005 chassis.

All Cisco 10005 line cards connect to a backplane in the center of the chassis, and require extender cards to deliver the alarm, BITS clock, and DS3 signals to the rear of the chassis to make them accessible. The Cisco 10005 alarm extender card and T3/E3 extender card extend and terminate these signals.

# Removing and Installing Line Cards

Some early Cisco 10008 chassis were shipped with front covers. The Cisco 10005 chassis has no front cover.

- If your Cisco 10008 chassis has no front cover, or if you have a Cisco 10005 router, go to one of the following sections:
  - Installing Full-Size Line Cards, page 17-10
  - Installing Half-Height Line Cards, page 17-16
  - Removing Full-Size Line Cards, page 17-46
  - Removing Half-Height Line Cards and Carrier, page 17-51
- If your Cisco 10008 chassis has a front cover, go to the "Removing the Cisco 10008 Front Cover" section on page 17-8.

# Removing the Cisco 10008 Front Cover

Use the following procedure to remove the front cover from the Cisco 10008 router (Figure 17-6 and Figure 17-7).

- If your Cisco 10008 router does not have a front bezel, go to the "Installing Full-Size Line Cards" section on page 17-10, the "Installing Half-Height Line Cards" section on page 17-16, the "Removing Full-Size Line Cards" section on page 17-46, or the "Removing Half-Height Line Cards and Carrier" section on page 17-51.
- If your Cisco 10008 router has a bezel with bezel plugs, go to step 1.
- If your Cisco 10008 router has a bezel without bezel plugs, go to step 2.

***Figure 17-6 Inserting a Screwdriver Blade into a Bezel Latch***

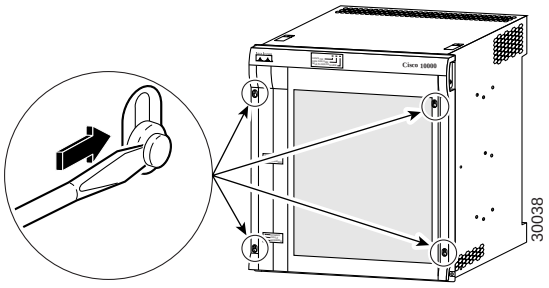
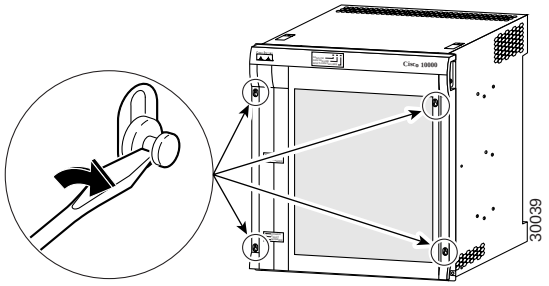


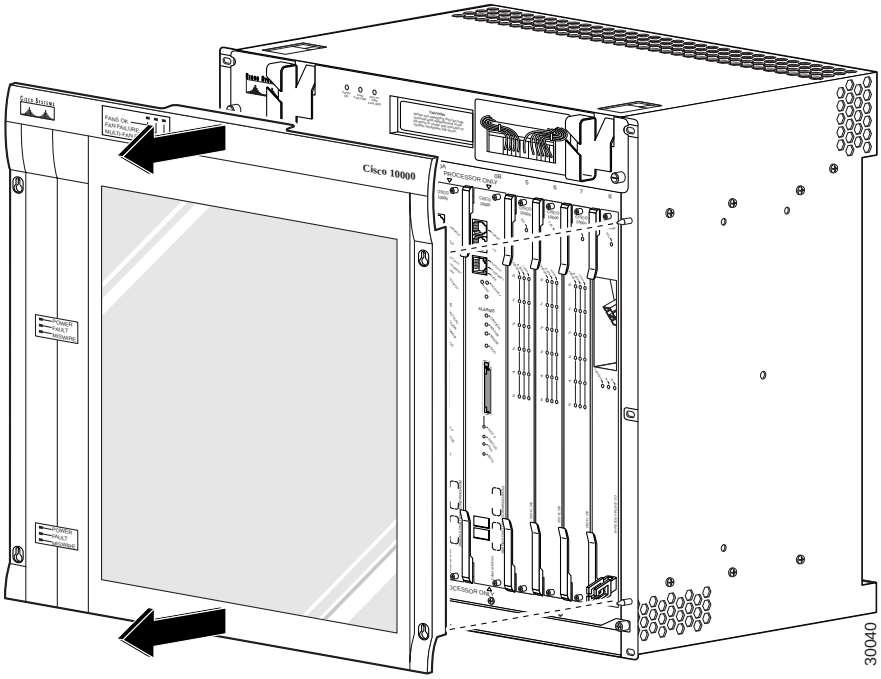

***Figure 17-7 Unlocking the Bezel Latch***




**Step 1** Unlock each bezel latch by inserting the tip of a flat-blade screwdriver between the top and bottom sections of the latch (see Figure 17-6), and then rotating the screwdriver to unlock the top portion of the latch (see Figure 17-7).

Repeat this procedure for all four bezel latches and then remove the latches (Figure 17-8).

*Figure 17-8 Removing the Front Cover from the Cisco 10008 Router*




**Step 2** Remove the cover by lifting it up slightly and then pulling it toward you.

If you are installing a line card, go to the "Installing Full-Size Line Cards" section on page 17-10 or the "Installing Half-Height Line Cards" section on page 17-16.

If you are removing a line card, go to the "Removing Full-Size Line Cards" section on page 17-46 or the "Removing Half-Height Line Cards and Carrier" section on page 17-51.

# Installing Full-Size Line Cards

This section provides step-by-step instructions for installing a full-size line card.

**Warning** **During this procedure, wear grounding wrist straps to avoid ESD damage to the card. Do not directly touch the backplane with your hand or any metal tool, or you could shock yourself.** Statement 94

Use the following procedure to install a full-size line card into any of the eight line card slots (slots 1 through 8) available in the Cisco 10000 chassis.

**Note** Before you begin this procedure., if you plan to replace a line card, see the "Removing Full-Size Line Cards" section on page 17-46.

## Replacement Installation Guidelines

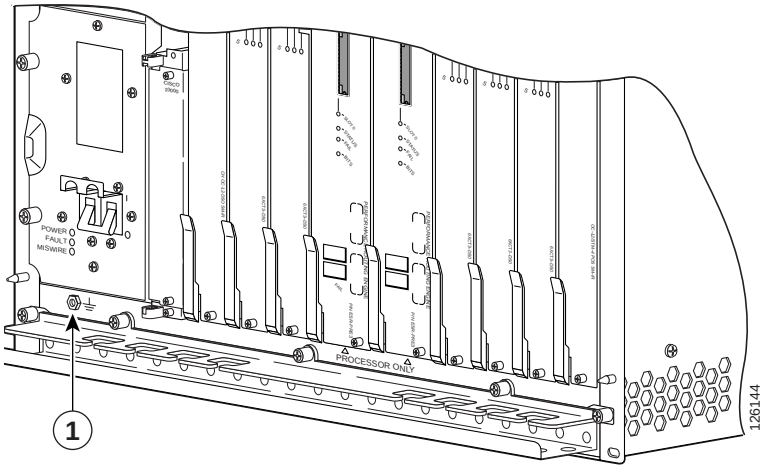
If you replace a line card in the same slot, the system automatically downloads the necessary configuration information from the Processor Route Engine (PRE); you do not need to configure the new line card. After the software downloads the information, the system recognizes only those interfaces that match the previous line card configuration (configured as up).

**Caution** To avoid erroneous line card failure messages, remove or insert only one line card at a time. Also, after you insert or remove a line card, wait at least 15 seconds before you insert or remove another line card so that the Cisco 10000 system can reinitialize and note the current configuration of all interfaces.

**Caution** To prevent electrostatic discharge (ESD) damage, handle line cards by the faceplate or the card carrier edges only. Avoid touching the line card printed circuit board, components, or any connector pins.

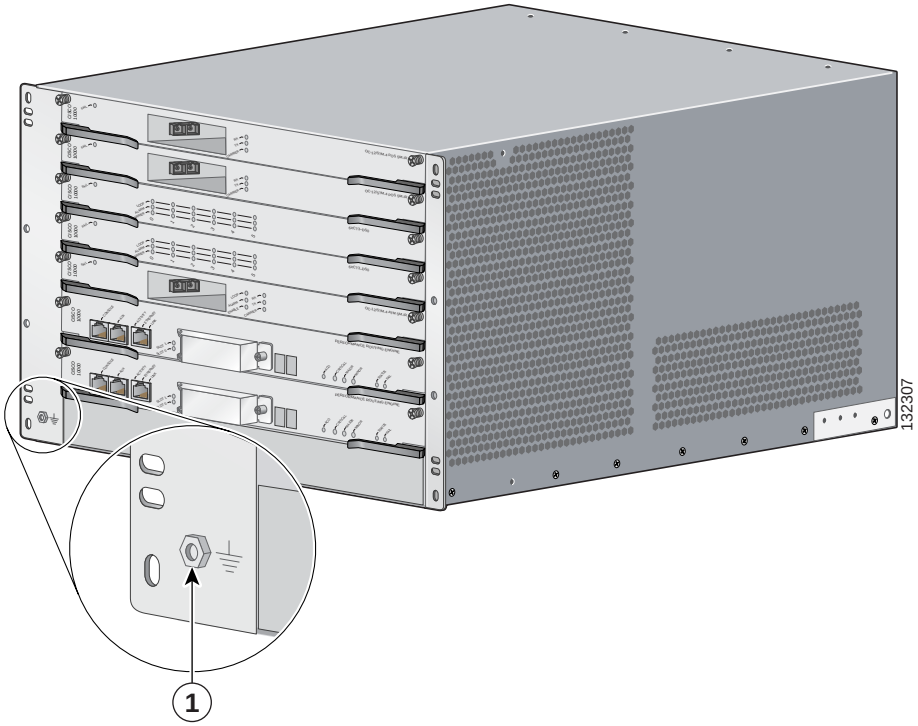
Figure 17-9 and Figure 17-10 show the ESD connections on the routers.

*Figure 17-9 ESD Chassis Connection—Cisco 10008 Router*




| | | | |
|---|---|---|---|
| 1 | ESD socket | | |

*Figure 17-10 ESD Chassis Connection—Cisco 10005 Router*



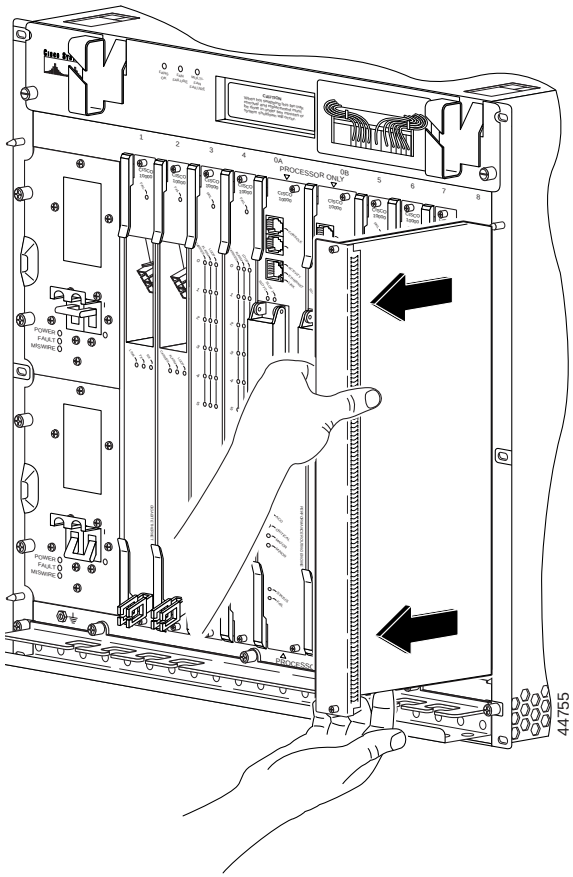

| | | | |
|---|---|---|---|
| 1 | ESD socket | | |

**Step 1** Attach an antistatic wrist strap to your wrist and to an ESD socket on the chassis, or to a bare metal surface on the chassis or frame.

**Note** For illustration purposes, line cards are shown being inserted only into the Cisco 10008 chassis.

**Step 2** Loosen the top and bottom captive screws on the blank faceplate or line card and slide it out of the slot (Figure 17-11).

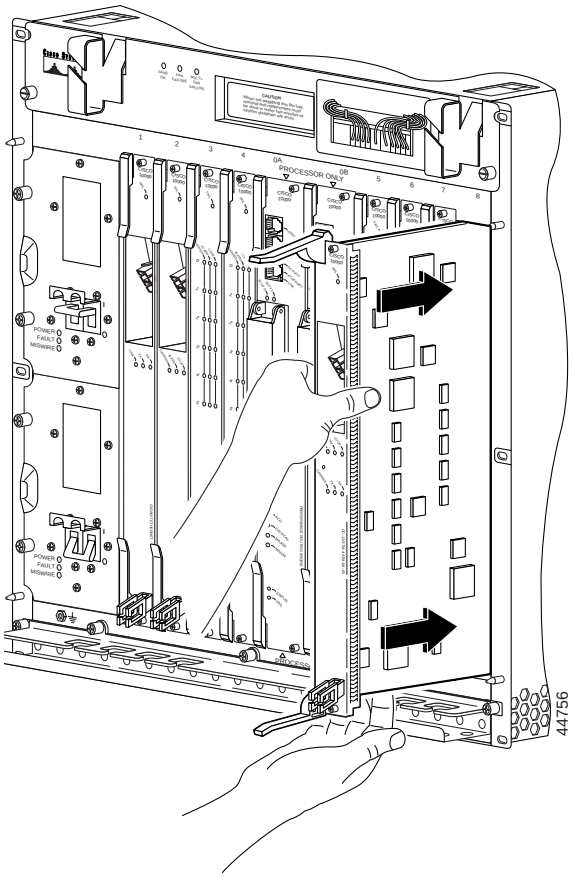
***Figure 17-11 Removing the Blank Faceplate***




**Step 3** Grasp the faceplate of the line card with one hand and place your other hand under the line card to support the weight of the line card. Position the card in front of the line card cage slot.

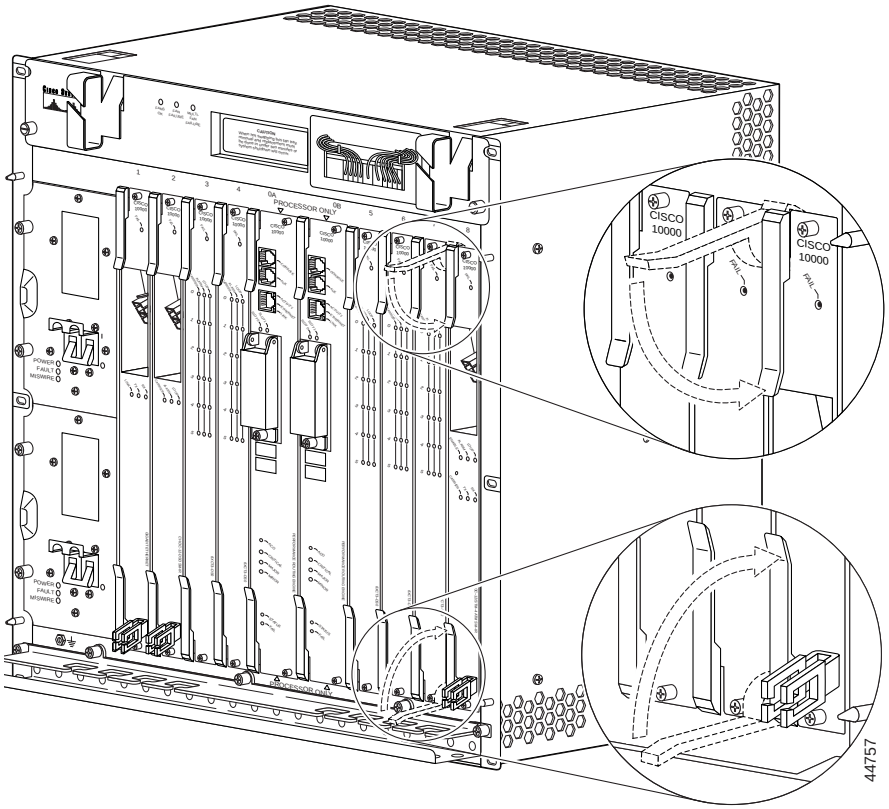
**Step 4** Carefully align the upper and lower edges of the line card with the upper and lower guides in the chassis, and slide the line card into the slot until you can feel it begin to seat in the backplane connectors ((Figure 17-12).

***Figure 17-12 Inserting a Full-Size Line Card***



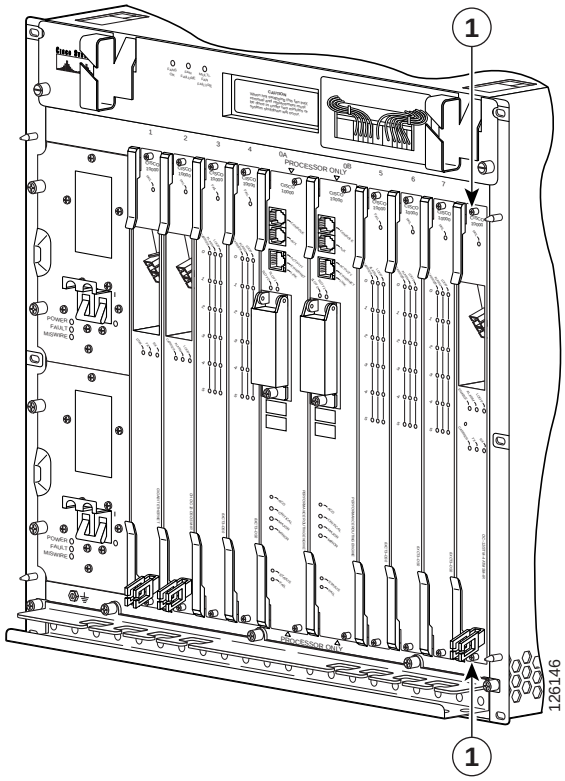
**Step 5** Simultaneously pivot both ejector levers toward each other (until they are parallel to the faceplate) to firmly seat the line card in the backplane (Figure 17-13).

***Figure 17-13 Closing the Ejector Levers***



**Step 6** Secure the line card in the chassis by tightening the top and bottom captive screws (Figure 17-14).

***Figure 17-14 Captive Screw Locations***




| | | |
|---|---|---|
| 1 | Captive screws | |

**Caution** To ensure that there is adequate space for additional line cards, always tighten the captive screws on each newly installed line card *before* you insert any additional line cards. These screws prevent accidental removal and provide proper grounding for electromagnetic interference (EMI) shielding.

**Warning** **Avoid eye or skin exposure to direct or scattered radiation.** Statement 1013

**Warning** **Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.** Statement 1051

The line card cycles through its power-on self-test (POST). The FAIL LED lights during portions of the POST, but remains off after POST on a properly working line card. If the FAIL LED remains on, go to Chapter 18, "Troubleshooting the Installation."

Depending on which line card you have installed, go to one of the following sections:

- Installing an SFP Module or GBIC Module, page 17-27.
- Attaching Cables, page 17-32.
- Appendix A, “Cisco 10005 Extender Card Information”

# Installing Half-Height Line Cards

This section describes how to install the half-height line card in the Cisco 10000 chassis. This section includes the following tasks:

- Replacement Installation Guidelines, page 17-16
- Installing the Half-Height Line Card Carrier, page 17-16
- Installing a Half-Height Line Card Into a Carrier, page 17-21

## Replacement Installation Guidelines

If you replace a line card in the same slot, the system automatically downloads the necessary configuration information from the Processor Route Engine (PRE); you do not need to configure the new line card. After the software downloads the information, the system recognizes only those interfaces that match the previous line card configuration (configured as up).

**Caution** To avoid erroneous line card failure messages, remove or insert only one line card at a time. Also, after you insert or remove a line card, wait at least 15 seconds before you insert or remove another line card so that the Cisco 10000 system can reinitialize and note the current configuration of all interfaces.

**Caution** To prevent electrostatic discharge (ESD) damage, handle line cards by the faceplate or the card carrier edges only. Avoid touching the line card printed circuit board, components, or any connector pins.

## Installing the Half-Height Line Card Carrier

You must install the half-height line card into a slot that contains a Cisco carrier, which can hold two half-height line cards. The two half-height line cards sharing a slot can be of any type, unless a specific, supported redundancy situation is being created. If both slots of the carrier are not used, you must install a carrier blank faceplate in the empty slot.

The Cisco 10000 series carrier for half-height line cards functions in any Cisco 10000 series router interface card slot. It supports online insertion and removal (OIR) of half-height line cards. The carrier is supported on the following:

- All Cisco 10000 series router chassis
- All Performance Routing Engines (PREs) on the Cisco 10000 series routers
- All half-height line cards for the Cisco 10000 series routers

**Caution** Do not install two carrier blank faceplates into a line card slot. Instead, install a full-slot blank faceplate into the subslot. The half-height blank faceplates do not have air dams, and the empty subslot will rob cooling air from the other slots. A carrier with one half-height line card and one half-height blank faceplate is allowed.

**Caution** Do not install a half-height line card into the carrier before installing the carrier into the chassis. The carrier does not have ejector levers that allow you to seat the half-height line card in the backplane.

**Warning** **During this procedure, wear grounding wrist straps to avoid ESD damage to the card. Do not directly touch the backplane with your hand or any metal tool, or you could shock yourself.** Statement 94

**Warning** **All safety requirements and recommendations must be read by all personnel prior to working on the system. Failure to follow the safety requirements and recommendations could result in injury.** Statement 297

Table 17-1 and Table 17-2 list Cisco carrier specifications.

***Table 17-1 Cisco Carrier for Cisco 10000 Half-Height Line Cards Product Identification***

| Product Identification | Description |
|---|---|
| ESR-HH-CARRIER= | Full-length base carrier for half-height line card |
| ESR-HH-COVER= | Blank filler for half-height line card |

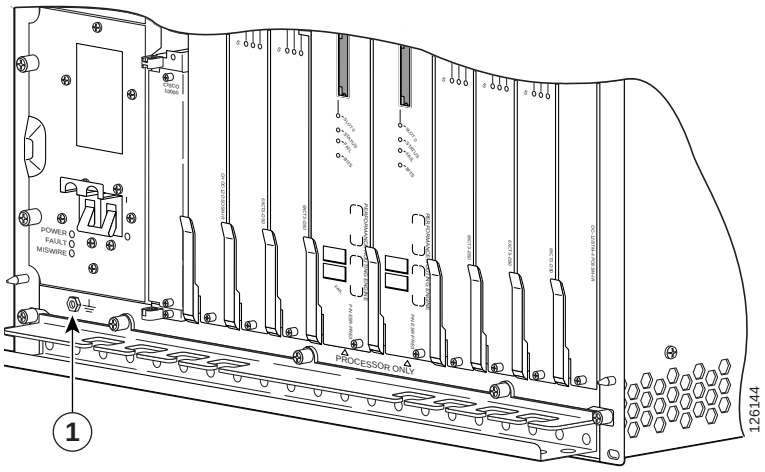
***Table 17-2 Cisco Carrier Specifications***

| Description | Specifications |
|---|---|
| Physical Dimensions | Height: 16.00 in. (40.64 cm) |
| | Width:1.18 in. (3.00 cm) |
| | Depth: 10.50 in. (26.67 cm) |
| Weight | 2.28 lb (1.05 kg) |

Follow these steps to install the carrier into any slot of the Cisco 10000 series chassis:

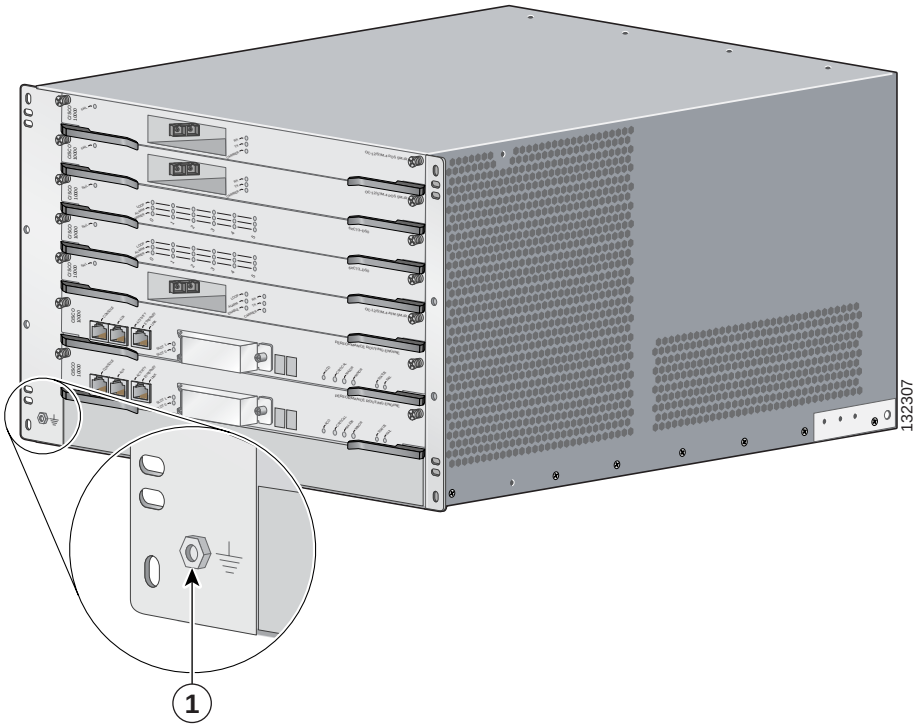
**Step 1** If you have not already done so, attach an antistatic wrist strap to your wrist and to an ESD socket on the chassis, or to a bare metal surface on the chassis or frame (Figure 17-15 or Figure 17-16).

***Figure 17-15 ESD Chassis Connection—Cisco 10008 Router***




| | | |
|---|---|---|
| **1** | ESD socket | |

*Figure 17-16 ESD Connection—Cisco 10005 Router*

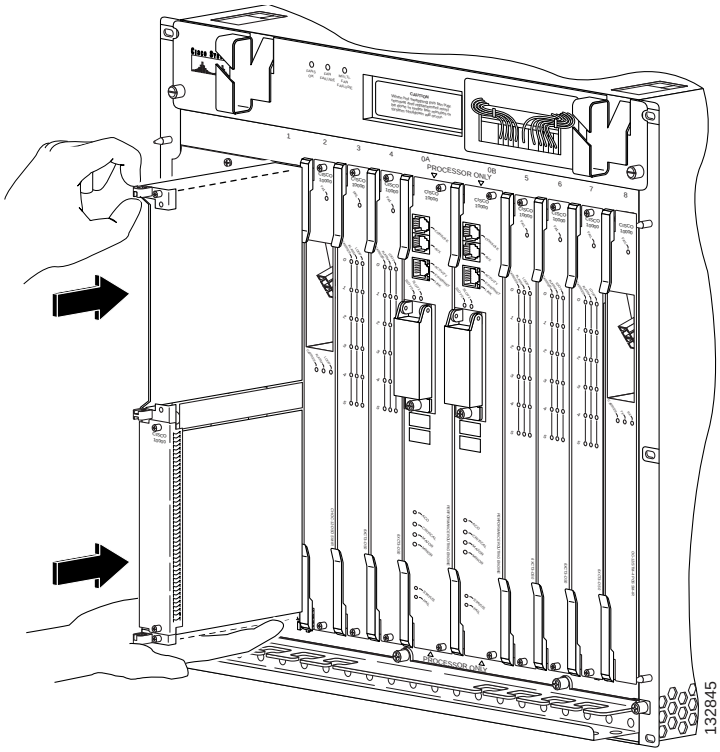



| | | |
|---|---|---|
| **1** | ESD socket | |

**Note** For illustration purposes, half-height line cards are shown inserted only into the Cisco 10008 chassis.

**Step 2** Put one hand under the carrier and the other on the top captive screw and carefully align the upper and lower edges of the carrier with the upper and lower guides in the chassis (Figure 17-17).

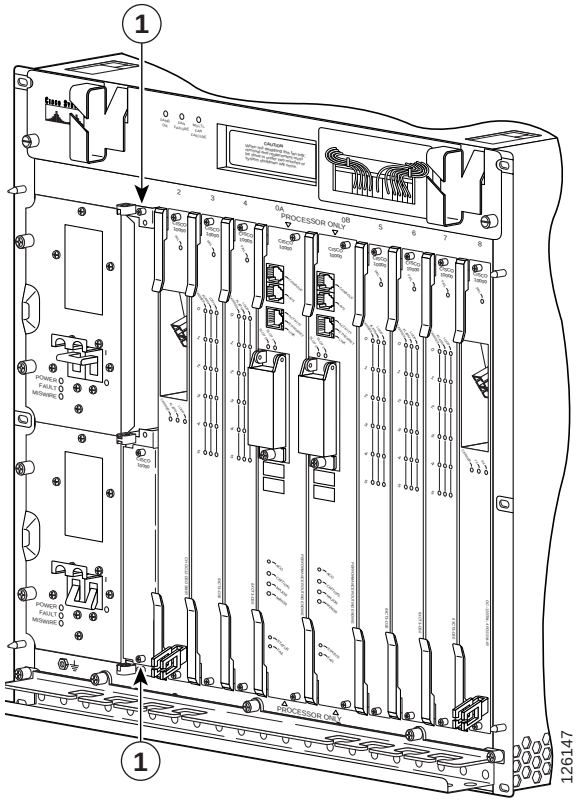
***Figure 17-17 Inserting the Carrier***




**Step 3** Slide the carrier into the slot guides.

**Step 4** After it is partially installed, grasp the top and bottom captive screws and slide the carrier into the slot until the front is flush with the chassis (Figure 17-18).

***Figure 17-18 Captive Screw Locations***




| | | |
|---|---|---|
| 1 | Captive screw | |

**Step 5** Secure the carrier to the chassis by tightening the top and bottom captive screws.

**Warning** **Do not operate the system unless all slots contain a line card or a blank faceplate. Do not use a carrier with no line cards; you must install a full-slot blank faceplate into slots that contain no cards. Blank faceplates are necessary in empty slots to prevent exposure to hazardous voltages, to reduce electromagnetic interference (EMI) that may disrupt other equipment, and to direct the flow of cooling air through the chassis.** Statement 156

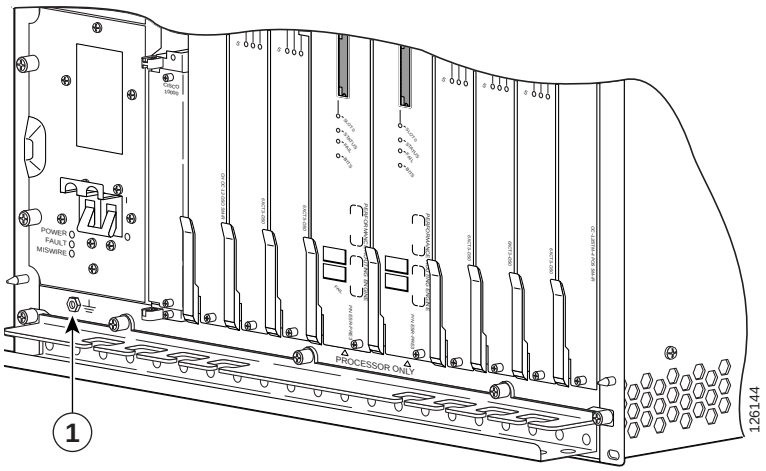
# Installing a Half-Height Line Card Into a Carrier

Use the following procedure to install a half-height line card into an installed carrier. If you have not installed the carrier, see the "Installing the Half-Height Line Card Carrier" section on page 17-16 to install the carrier in the chassis, before beginning the instructions in this section.

If you plan to replace a half-height line card, see the "Removing a Half-Height Line Card" section on page 17-51 before you begin this procedure.

**Step 1** Attach an antistatic wrist strap to your wrist and to an ESD socket on the chassis, or to a bare metal surface on the chassis or frame (Figure 17-19).

***Figure 17-19 ESD Chassis Connection—Cisco 10008 Router***

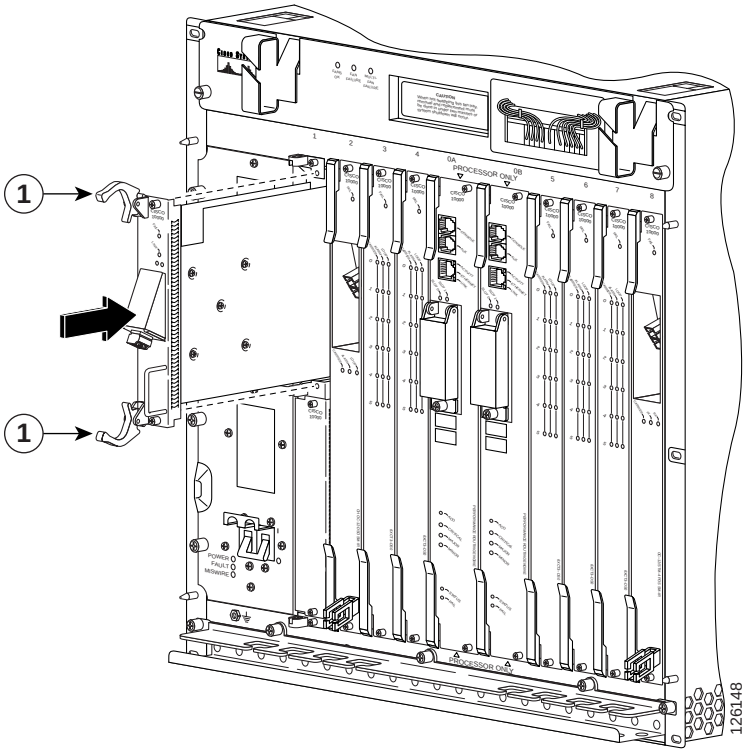



| | | |
|---|---|---|
| **1** | ESD socket | |

**Caution** Always insert the carrier into the chassis before inserting the half-height line cards.

**Step 2** Grasp the faceplate of the half-height line card with one hand and place your other hand under the card to support its weight. Position the card in front of the carrier (Figure 17-20).

***Figure 17-20 Inserting the Line Card***



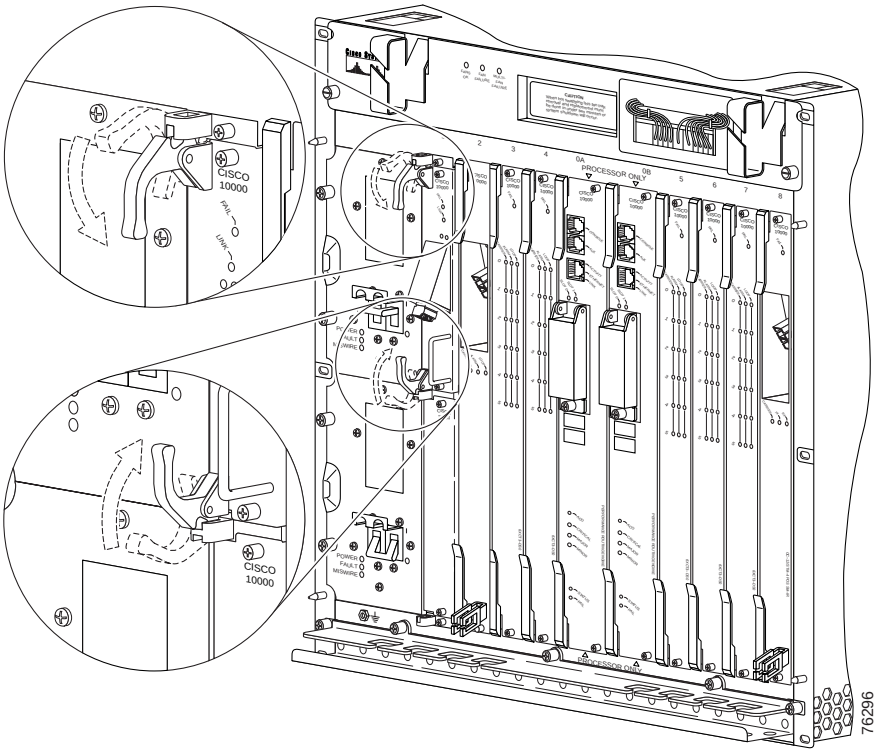

| | | |
|---|---|---|
| **1** | Ejector lever | |

**Step 3** Align the upper and lower edges of the half-height line card with the upper and lower guides in the carrier, and slide the half-height line card about halfway into the carrier.

**Step 4** Be sure the ejector levers are in the open position (as shown) and continue to push the half-height line card into the carrier until you can feel it begin to seat in the backplane connectors.

**Step 5** Simultaneously pivot both ejector levers toward each other (until they are parallel to the faceplate) to firmly seat the half-height line card in the backplane (Figure 17-21).

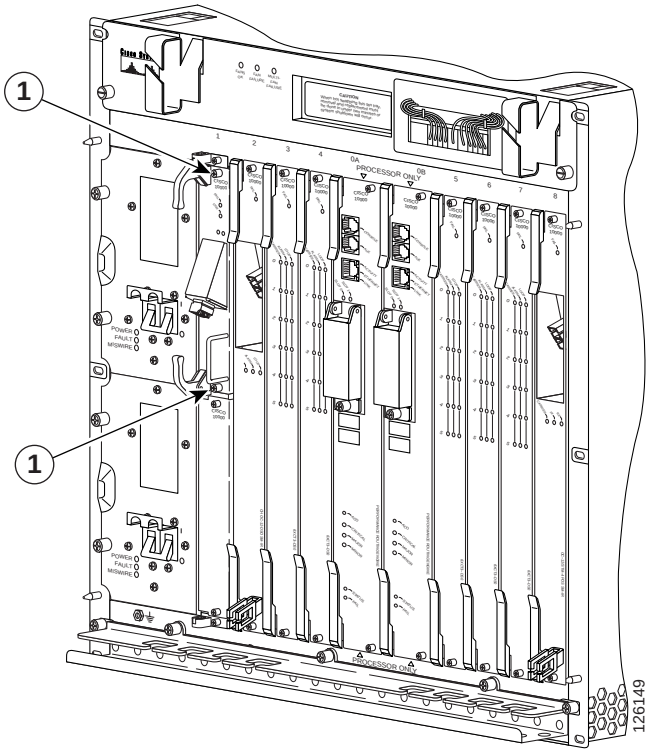
***Figure 17-21 Closing the Ejector Levers***




The line card cycles through its power-on self-test (POST). The Fail LED lights during portions of the POST, but remains off after POST on a properly working line card. If the Fail LED remains on, go to Chapter 18, "Troubleshooting the Installation."

**Step 6** Secure the half-height line card in the chassis by tightening the top and bottom captive screws (Figure 17-22).

***Figure 17-22 Captive Screw Locations***




| | | | |
|---|---|---|---|
| **1** | Captive screws | | |

**Caution** To ensure that there is adequate space for additional line cards, always tighten the captive screws on each newly installed line card *before* you insert any additional line cards. These screws prevent accidental removal and provide proper grounding for electromagnetic interference (EMI) shielding.

**Warning** **Avoid eye or skin exposure to direct or scattered radiation.** Statement 1013

**Warning** **Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.** Statement 1051

Depending on which half-height line card you have installed, go to one of the following sections:

- Installing an SFP Module or GBIC Module, page 17-27.
- Attaching Cables, page 17-32.

# Installing SFP Modules or GBIC Modules

We recommend inspecting and cleaning optics before installation. See the *Inspection and Cleaning Procedures for Fiber-Optic Connections* document and the *Compressed Air Cleaning Issues for Fiber-Optic Connections* for more information on cleaning optical devices.

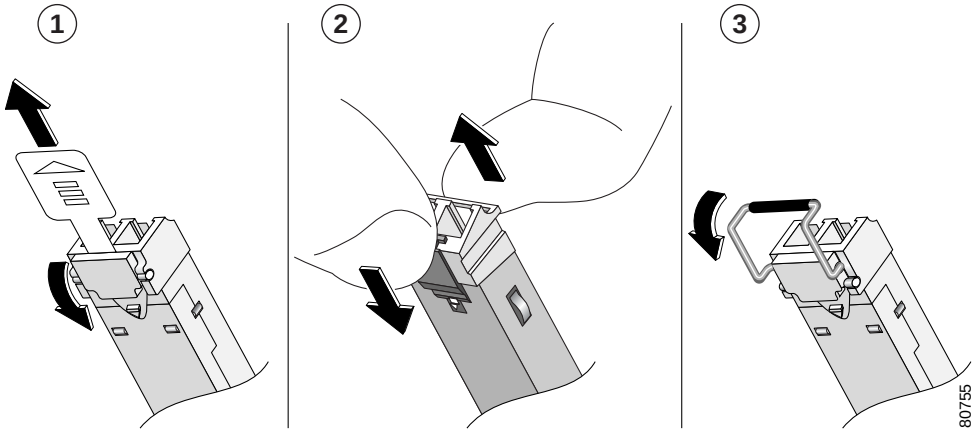
The following information is in this section:

- Guidelines for Using SFP Modules or GBIC Modules, page 17-26
- Installing an SFP Module or GBIC Module, page 17-27
- Installing an SFP Module, page 17-28
- Installing a GBIC Module, page 17-30

## Guidelines for Using SFP Modules or GBIC Modules

SFP modules from different manufacturers provide different methods for freeing the locking pin and removing the SFP module. Figure 17-23 shows three module types.

***Figure 17-23 Types of SFP Module Latches***




| | | | |
|---|---|---|---|
| **1** | Tab latch | **3** | Bale latch |
| **2** | Swing and slide latch | | |

- The SPF module has three types of latches, which are also the removal mechanism. See Figure 17-23.
  - Tab SFP module—Pulling the tab simultaneously releases the locking pin and pulls the SFP module out of its receptacle.

  - Swing and slide latch SFP module—Swinging the latch out releases the locking pin and pulls the SFP module out after it is inserted.
  - Bale latch SFP module—Opening the bale clasp releases the locking pin so you can remove the SFP module from its receptacle.
- There is no correlation of the type of latch to the model (such as SX or LH) or technology type (such as Gigabit Ethernet) of SFP modules. Always read the label on the SFP module or GBIC module to determine the technology type and model.
- You can install and remove SFP modules and GBIC modules with power on to the system.
- Disconnect all cables before removing or installing a GBIC module or SFP module. We strongly recommend that you do *not* install or remove the GBIC module or SFP module with cables attached to it.
- GBIC modules and SFP modules are keyed to prevent incorrect insertion.

# Installing an SFP Module or GBIC Module

**Warning** **Avoid eye or skin exposure to direct or scattered radiation.** Statement 1013

**Warning** **Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.** Statement 1051

**Warning** **Class 1 laser product.** Statement 1008

**Warning** **Class 1 LED product.** Statement 1027

Your line card may ship with an SFP module installed. Use the procedures in this section if you need to install or change the SFP module.

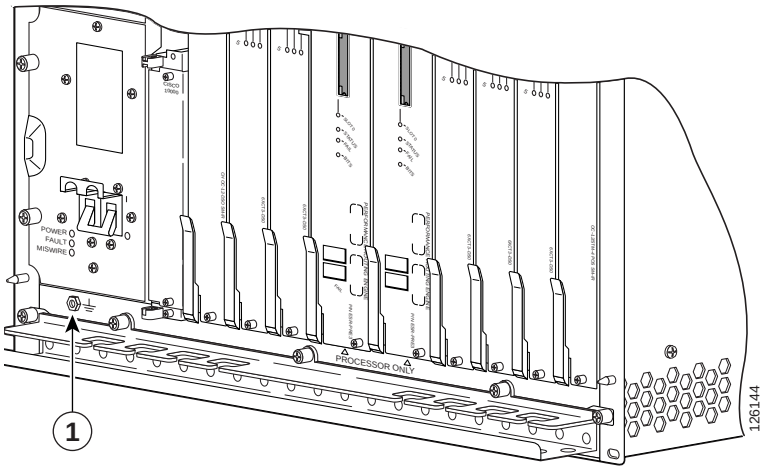
Use only SFP modules supplied by Cisco with your line card. Each SFP module contains an internal serial EEPROM that is security-programmed by the SFP manufacturer with information that provides a way for Cisco (through Cisco IOS software) to identify and validate the SFP module as a module type that is tested and qualified by Cisco to operate properly with your line card. Unapproved SFP modules (those not purchased directly from Cisco) do not work with the line card.

## Installing an SFP Module

This section describes the procedure to insert an SFP module into the Gigabit Ethernet half-height line card.

**Step 1** Attach an antistatic wrist strap to your wrist and to an ESD socket on the chassis, or to a bare metal surface on the chassis or frame (Figure 17-24).

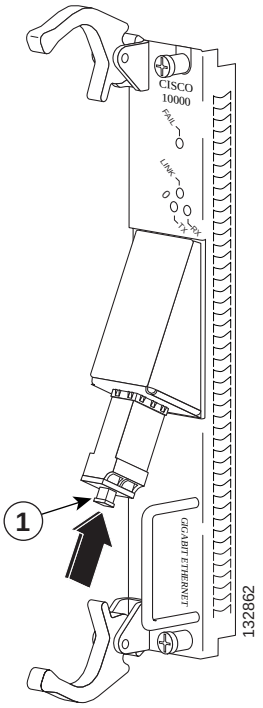
***Figure 17-24 ESD Chassis Connection—Cisco 10008 Router***




| | | |
|---|---|---|
| **1** | ESD socket | |

**Step 2** Gently insert the SFP module into the line card port until the edge connector is fully seated in the connector (Figure 17-25). As the triangular pin on the bottom of the SFP module snaps into place, you hear a click.

*Figure 17-25 Inserting the SFP Module*




| | | |
|---|---|---|
| **1** | Dust plug | |

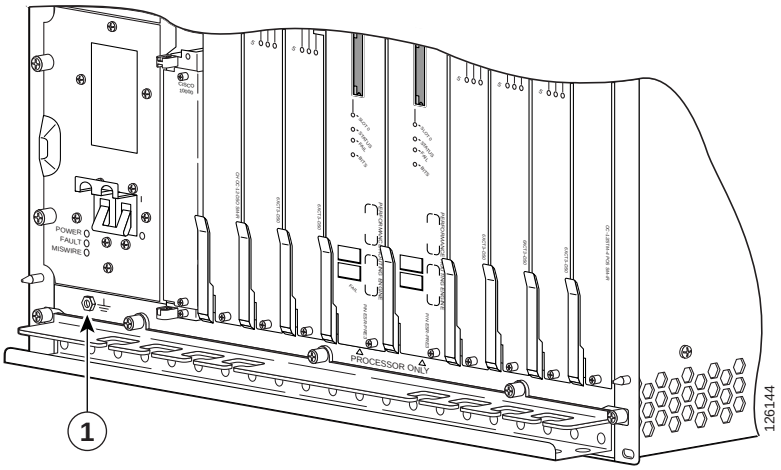
**Step 3** Remove the dust plug from the SFP module so that you can insert the cables. Keep the plug for use should you ever disconnect the optical fiber cables.

Go to the "Attaching Cables" section on page 17-32.

## Installing a GBIC Module

Figure 17-26 and Figure 17-27 show how to install a GBIC module:

***Figure 17-26 ESD Chassis Connection—Cisco 10008 Router***




| | | |
|---|---|---|
| **1** | ESD socket | |

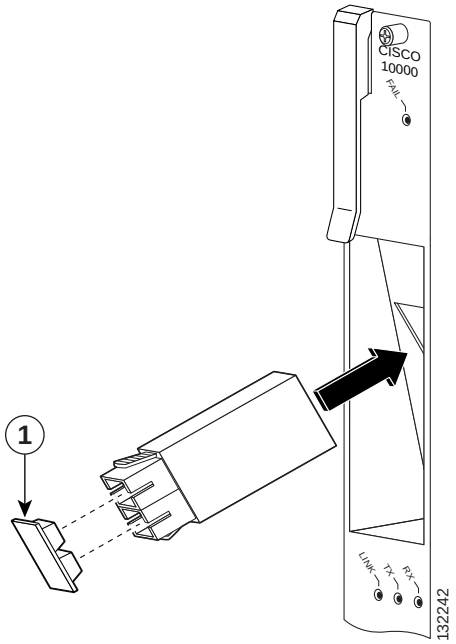
**Step 1** Attach an ESD wrist strap to your wrist and to the ESD connection socket on the chassis or to a bare metal surface on the chassis or frame.

**Step 2** Locate the alignment groove on the GBIC module.

**Step 3** Align the groove on the GBIC with the interface opening.

**Note** GBIC modules are keyed to prevent incorrect insertion.

*Figure 17-27 Installing a GBIC Module*




| | | | |
|---|---|---|---|
| **1** | Plug | | |

**Step 4** Insert the GBIC into the GBIC slot guides. When installed, the GBIC input/output panel should be flush with the face of the router. The tabs on either side of the GBIC will snap into place when the GBIC is properly inserted.

**Caution** Do not remove the plug until you are ready to install the cables.

This completes the procedure for installing a GBIC module.

Proceed to the "Attaching Cables" section on page 17-32 to attach the SC-type fiber-optic cable to the GBIC module.

# Attaching Cables

This section contains the following information:


- Attaching Multimode and Single-Mode Optical Fiber Cables, page 17-32
- Attaching RJ-45 Ethernet Cables, page 17-35
- Attaching the 24-Port Channelized E1/T1 Line Card Adapter Cable, page 17-36
- Attaching Coaxial Cables, page 17-37
- Attaching the 4-Port Channelized T3 Half-Height Line Card Optional Y-Cables, page 17-39


## Attaching Multimode and Single-Mode Optical Fiber Cables

Before attaching optical fiber cables, we recommend that you first clean them. Attaching dirty fiber-optic cables to a line card may result in the line card appearing to not function.

For information about cleaning fiber-optic cable connectors and receptacles, see the *Inspection and Cleaning Procedures for Fiber-Optic Connections* document and the *Compressed Air Cleaning Issues for Fiber-Optic Connections* for more information on cleaning optical devices.

It provides detailed illustrations and photos of procedures and equipment required to properly clean fiber-optic connections.

Both simplex (Figure 17-28) and duplex SC- (Figure 17-29) and LC-type (Figure 17-30, Figure 17-31) connectors are described in this section.

***Figure 17-28 Simplex SC-Type Cable and Connector***

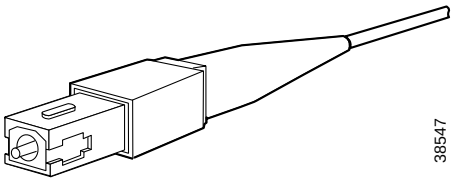



***Figure 17-29 Duplex SC-Type Cable and Connector***

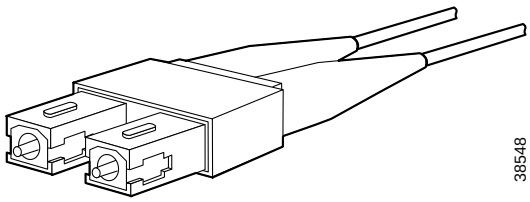


*Figure 17-30 Simplex LC-Type Cable and Connector*

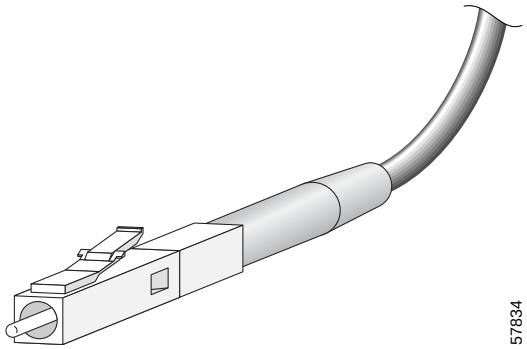
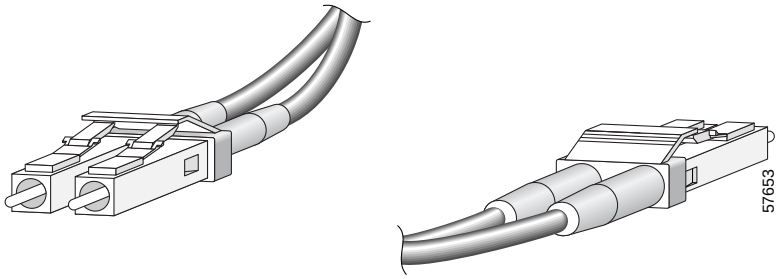



*Figure 17-31 Duplex LC-Type Cable and Connector*




Attach the appropriate optical fiber cable directly to the SC-type receptacle on the GBIC module, the LC-type connector on the SFP module, or the LC- or SC-type connector on the line card. You can use either simplex or duplex connectors for most devices.

- For simplex connectors, two cables are required, one cable for transmit (TX) and a second cable for receive (RX).
- For duplex connectors, only one cable that has both TX and RX connectors is required.

**Note** For LR, a minimum of 10 dB of total attenuation between transmitter and receiver is required. Exceeding the maximum receive power can damage the optics.

**Note** For LR2, a minimum of 12 dB of total attenuation between transmitter and receiver is required. Exceeding the maximum receive power can damage the optics.

**Warning** **Avoid eye or skin exposure to direct or scattered radiation.** Statement 1013

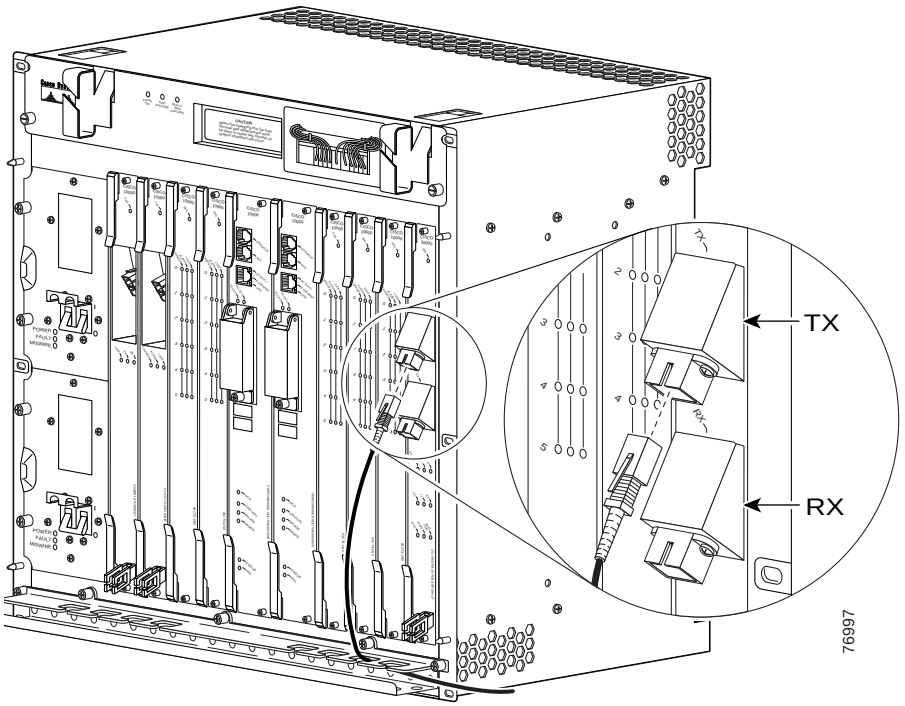
**Warning** **Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.** Statement 1051

**Caution** If you plan to use a GBIC-LX/LH at distances greater than 984.25 feet (300 meters) over 50/125-micron or 62.5/125-micron multimode fiber, to prevent data transmission problems you must use the mode-conditioning patch cord. (See the "Mode-Conditioning Gigabit Ethernet Patch Cord Description" section on page 10-11 or the "Mode-Conditioning Gigabit Ethernet Patch Cord Description" section on page 11-8.)

**Step 1** Remove the protective cap from the fiber-optic cable connectors and port receptacles.

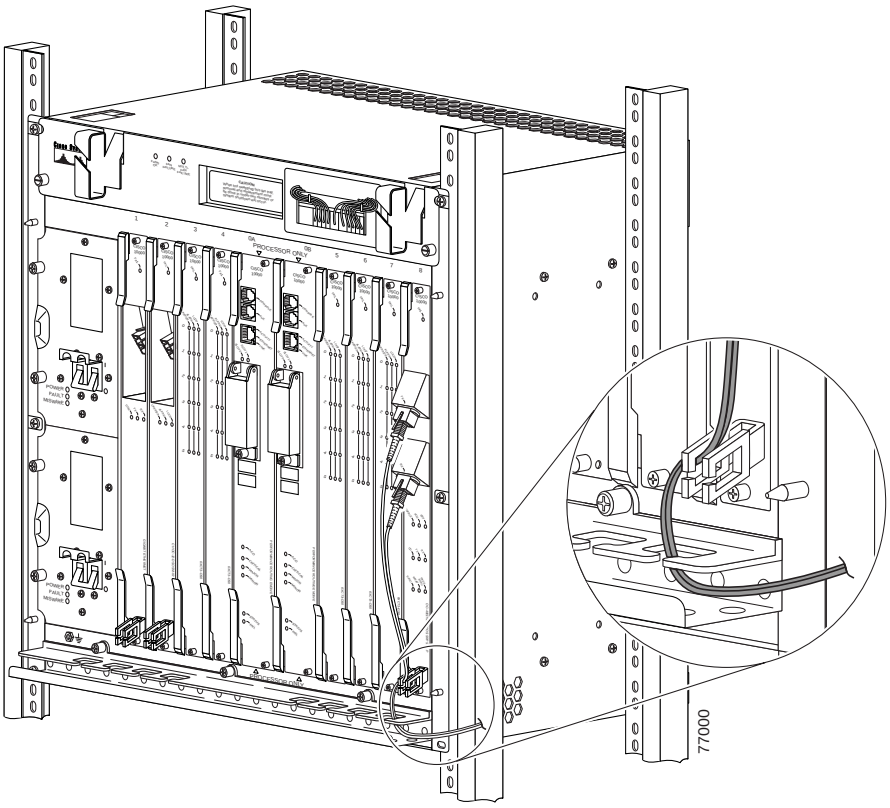
**Step 2** Attach the fiber-optic cable to the port receptacles, making sure to connect the TX and RX ends of the cable to the corresponding TX and RX connectors on the port (Figure 17-32).

***Figure 17-32 Connecting an Optical Fiber Cable***




**Step 3** Run the optical fiber cable through the cable bracket on the line card, through the bottom cable management bracket, and then out to the left or right of the chassis (Figure 17-33).

*Figure 17-33 Optical Fiber Cable Management*



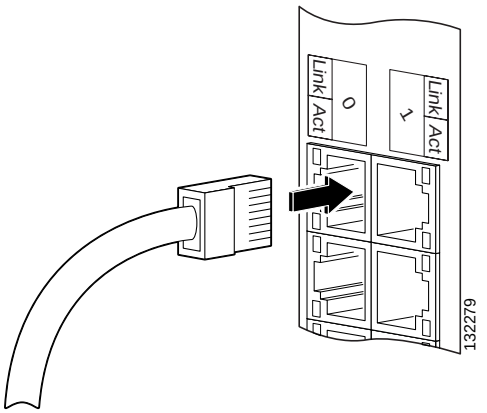

Go to the "Checking the Installation" section on page 17-58.

# Attaching RJ-45 Ethernet Cables

Use this section for information on attaching Ethernet cables to the RJ-45 ports on line cards and copper SFP modules.

**Step 1** Orient and insert the RJ-45 cable connector with the RJ-45 port on the line card or copper SFP module. Figure 17-34 shows how to orient and attach an Ethernet cable to a RJ-46 port on the faceplate of the 8-port Ethernet half-height line card.

*Figure 17-34 Attaching Ethernet Cables*

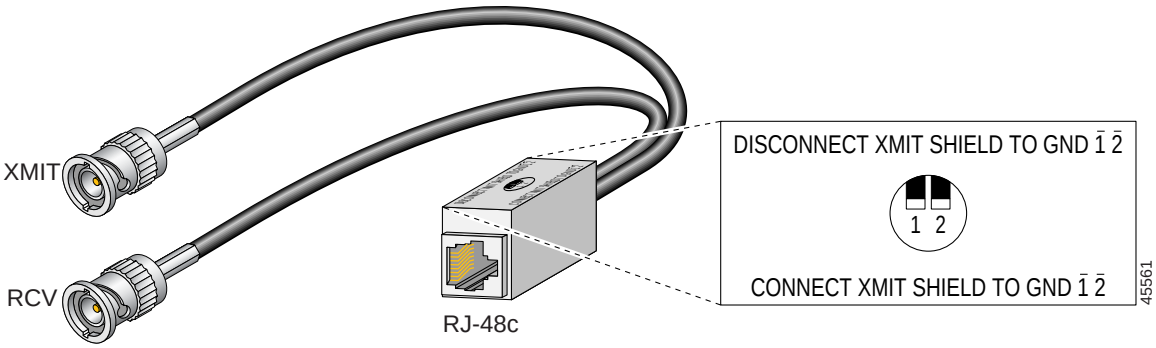



**Step 2** Go to the "Checking the Installation" section on page 17-58.

# Attaching the 24-Port Channelized E1/T1 Line Card Adapter Cable

An RJ-45 STP cable with two male RJ-45 connectors is required to connect the adapter cable and RJ-45 ports on the face of the line card (Figure 17-35).

*Figure 17-35 75–120 Ohm Adapter Cable*

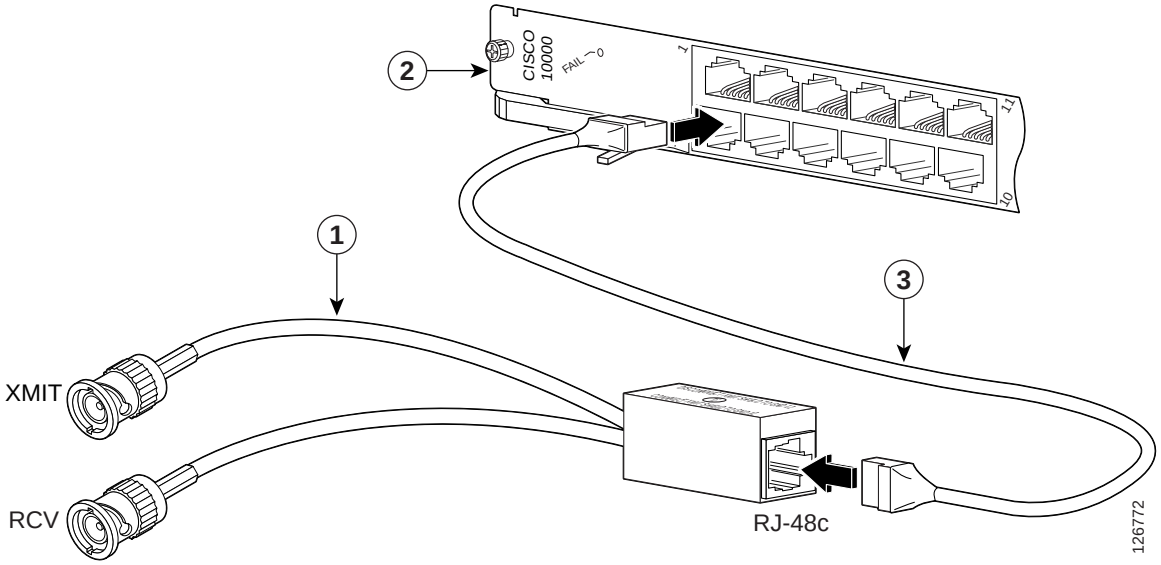



Cisco cable adapters (CAB-ADAPT-75-120) connect 75-ohm unbalanced G.703 E1 coaxial BNC transmit and receive lines to Cisco E1 120-ohm balanced transmit and receive lines

To attach the adapter cable for the 24-port channelized E1/T1 line card, follow these instructions:

**Step 1** Connect an RJ-45 shielded twisted-pair (STP) cable to a port on the faceplate of the 24-port Channelized E1/T1 line card (Figure 17-36).

***Figure 17-36 Attaching the RJ-45 Port STP Cable to the Adapter Cable***




| | | | |
|---|---|---|---|
| **1** | Adapter cable | **3** | Connecting cable (RJ-45 STP, male/male) |
| **2** | RJ-45 ports on faceplate | | |

**Step 2** Connect the opposite end of the RJ-45 STP cable to the adapter cable as shown in Figure 17-36.

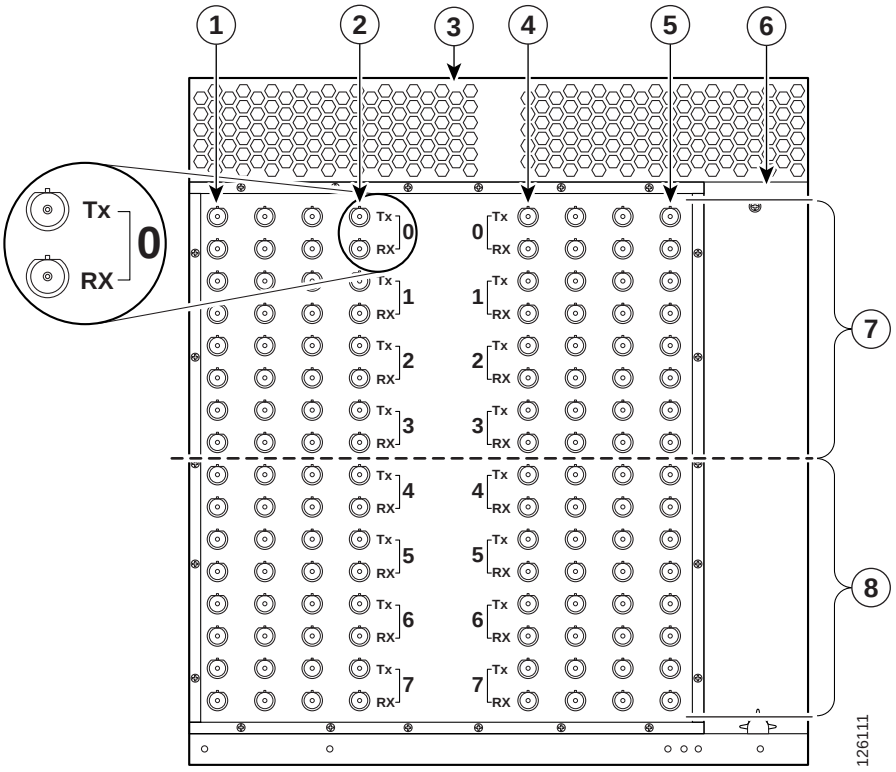
Go to the "Checking the Installation" section on page 17-58.

# Attaching Coaxial Cables

If your line card uses the BNC connectors on the rear of the router, attach the cables as noted in the specific line card overview chapter.

Figure 17-37 shows an overview of the BNC connectors on the rear of the chassis.

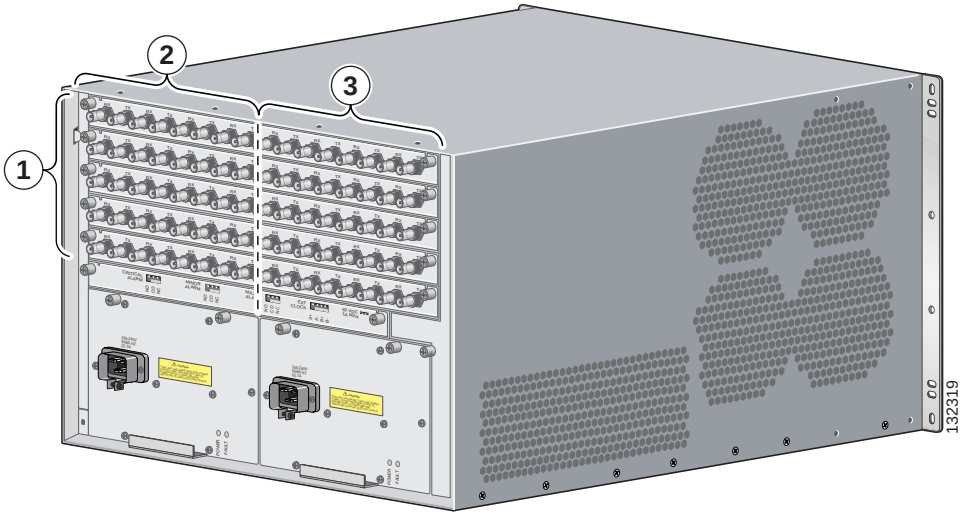
***Figure 17-37 Identifying the BNC Connectors and Half-Height Card Subslots—Cisco 10008 Router***




| | | | |
|---|---|---|---|
| **1** | Line card slot 8 | **5** | Line card slot 1 |
| **2** | Line cards slot 5 | **6** | Power supply |
| **3** | Blower module | **7** | Half-height line card subslot 0 |
| **4** | Line card slot 4 | **8** | Half-height line card subslot 1 |

Figure 17-38 shows BNC connectors and card subslots.

*Figure 17-38 Identifying the BNC Connectors and Half-Height Card Subslots—Cisco 10005 Router*




| | | | |
|---|---|---|---|
| 1 | Line card slots 1 (top) to 5 (bottom) | 3 | Subslots 1/0 (top) to 5/0 (bottom) |
| 2 | Subslots 1/1 (top) to 5/1 (bottom) | | |

Go to the "Checking the Installation" section on page 17-58.

# Attaching the 4-Port Channelized T3 Half-Height Line Card Optional Y-Cables

The Y-cables described in this section are only for the 4-port channelized T3 half-height line card, and are only used when configuring redundancy. The optional Y-Cable product number is CAB-BNC-71NY=.

**Caution** Do not install Y-cables unless you are using the Y-cable redundancy feature and have read all of these instructions.

**Caution** The Y-cables must be installed before configuring redundancy, and removed before deconfiguring redundancy.

Use the following information when preparing to install the Y-cables (Figure 17-39):

- Eight BNC ports are arranged vertically per line card slot.
- Two BNC connectors, one TX and one RX, are used per port.
- Two 4-port channelized T3 half-height line cards can be placed in one slot, using the carrier, with four BNC ports allocated for each 4-port channelized T3 half-height line card.
- When the 4-port-port channelized T3 half-height line card is in subslot 0 (the top subslot), the BNC connectors in use are ports 0 through 3.

- When the 4-port channelized T3 half-height line card is in subslot 1 (the bottom subslot), the BNC connectors in use are ports 4 through 7.

**Caution** Read all the information in the section before installing a Y-cable for redundancy.

***Figure 17-39 Optional Y-Cable***

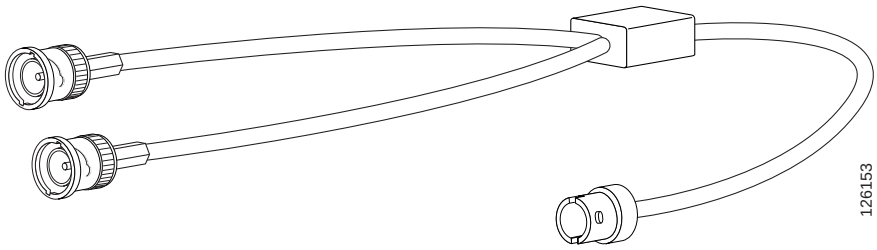
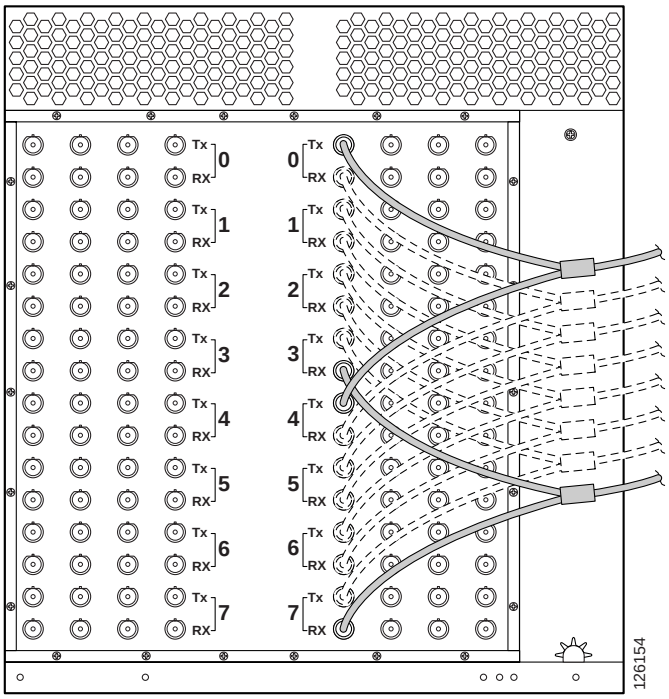



Figure 17-40 shows the optional connections.

***Figure 17-40 Optional Y-Cable Connections***




The optional Y-cables can be used to provide one-to-one line card redundancy. For Y-cable redundant applications, see the "Configuration Summary" section on page 17-41, and configure the hardware as follows:

- Two 4-port channelized T3 half-height line cards must share the same slot.
- Eight Y-cables are required to configure a redundant pair of 4-port channelized T3 half-height line cards.

- The Y-cable has three BNC connectors. The two similar connectors must be connected to BNC connectors on the Cisco 10000 series router backplane corresponding to similar functions on each line card (for example, RX to RX), with the remaining connector being connected to the cable from the customer's network. See Figure 17-40. The following text explains how the Y-cable connects two 4-port channelized T3 half-height line cards. Additional Y-cables can be used as required.
  - The Y-cable connects the 4-port channelized T3 half-height line card in subslot 0, port 0 RX to the 4-port channelized T3 half-height line card in subslot 1, port 0 RX.
  - Another Y-cable would connect to the 4-port channelized T3 half-height line card in subslot 0, port 0 TX to the 4-port channelized T3 half-height line card in subslot 1, port 0 TX.
  - The remaining six Y-cables are connected in a similar fashion to form a completely redundant configuration.

## Configuration Summary

**Caution** The Y-cables must be installed before configuring redundancy, and removed before deconfiguring redundancy.

1. To configure redundancy, you must:
   a. Attach all Y-cables in this order: to the primary line card, to the secondary line card, and to the far end.
   b. Configure the primary line card.
   c. Configure the secondary line card.
2. To deconfigure redundancy:
   a. Use "red line switch from..." to make the secondary line card standby (if it is active) and the primary line card active if you want to deconfigure only the secondary line card (perhaps for servicing).
   b. Detach the Y-cable from all ports on the secondary line card.
   c. Deconfigure the secondary line card.
3. If you want to deconfigure all redundancy, you must:
   a. Remove all the Y-cables and the cable for nonredundancy if desired.
   b. Deconfigure the secondary line card and primary line card.

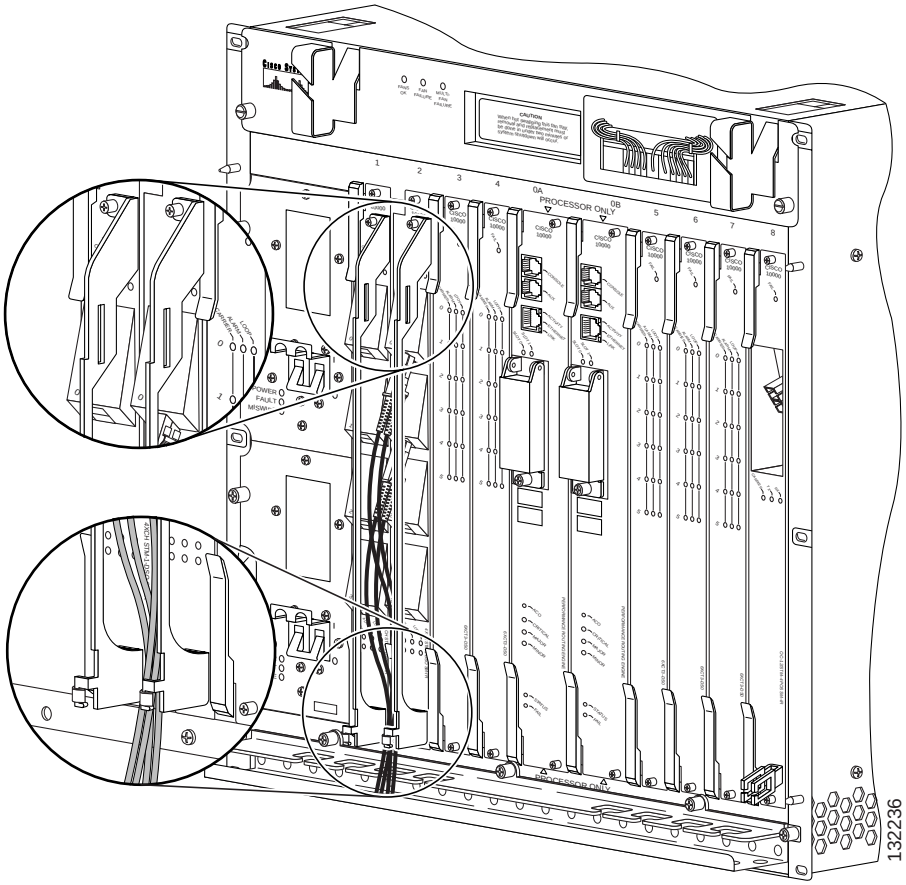
See the *Cisco 10000 Series Routers Line Card Configuration Guide* for information about configuring redundancy using the optional Y-cables.

Go to "Checking the Installation" section on page 17-58.

# Using the Cable-Management Bracket

After attaching the appropriate cables, thread the cables through the cable-management brackets attached to full-sized line cards (Figure 17-41). Half-height line cards do not have cable-management brackets.

***Figure 17-41 Using the Cable-Management Bracket***




Use the Velcro strap at the bottom of the cable-management bracket to gather and tie the cables together.

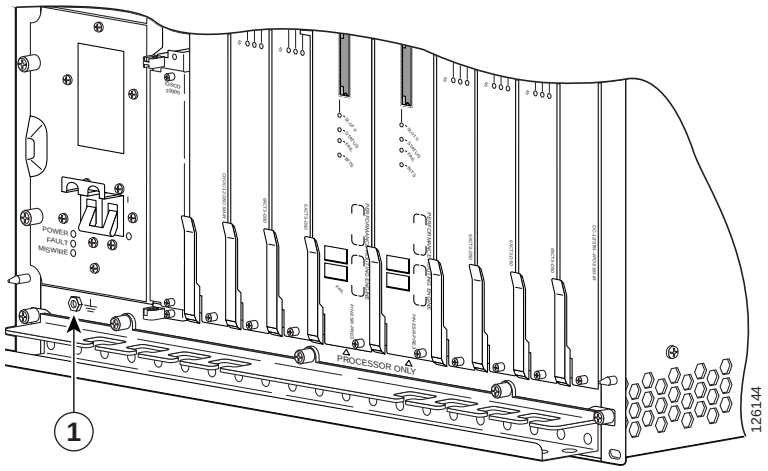
# Removing an SFP Module or GBIC Module

Use the following procedure to remove an SFP module or GBIC module from a line card.

**Note** You can remove an SFP module or GBIC module while the system is powered on, but the interface shuts down.

**Step 1** Attach an antistatic wrist strap to your wrist and to an ESD socket on the chassis, or to a bare metal surface on the chassis or frame (Figure 17-42).

***Figure 17-42 ESD Chassis Connection***




| | | |
|---|---|---|
| 1 | ESD socket | |

**Note** For illustration purposes, only an SFP module is shown in the following illustrations (Figure 17-43). The locking and unlocking mechanisms shown appear on both SFP modules and GBIC modules.

**Step 2** Disconnect the LC-type or SC-type optical fiber cable connector from the SFP module or GBIC module. Note which cable connector plug is TX and which is RX for reattachment.

***Figure 17-43 Disconnecting the LC-Type Optical Fiber Cable***

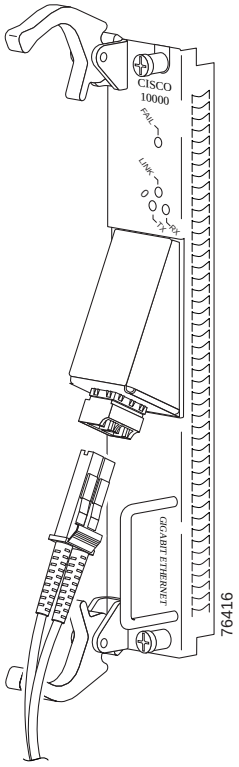


*Figure 17-44 Removing a Tab-Type SFP Module*

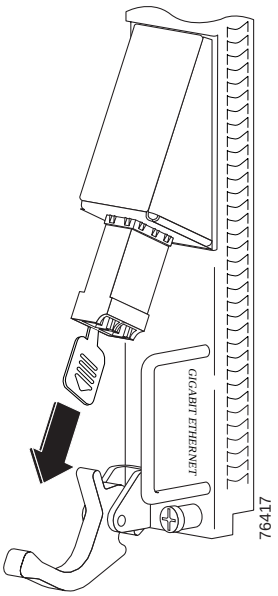


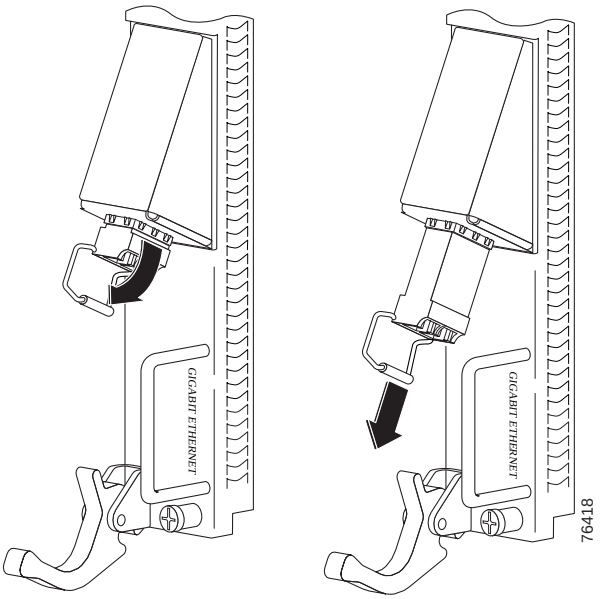

Figure 17-44 and Figure 17-45 show SFP modules s with two different types of locking mechanisms being removed.

**Step 3** Unlock and remove the SFP module as follows:

- Tab SFP modules—Gently, but firmly, pull the plastic tab to free the locking pin and remove the SFP module (see Figure 17-44).

**Caution** Do not twist the tab when you remove the SFP module or GBIC module. Twisting the tab may disconnect it from the module.

*Figure 17-45 Removing a Bale Clasp -Type SFP Module*




- Open the bale type latch by pressing the clasp downward until it is in a horizontal position as shown in Figure 17-45.

**Step 4** Grasp the SFP module by the latch and gently pull it out of the line card.

**Warning** **Avoid eye or skin exposure to direct or scattered radiation.** Statement 1013

**Warning** **Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.** Statement 1051

**Step 5** After removing the SFP module or GBIC module, place the module in an antistatic bag or other protective environment.

# Removing Full-Size Line Cards

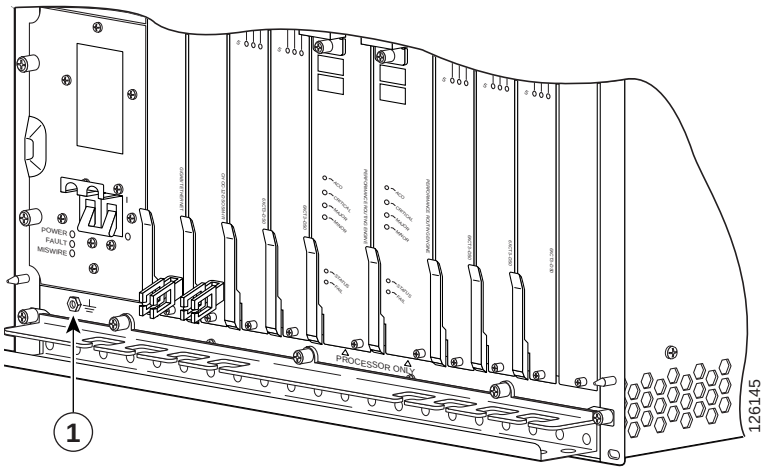
**Note** It is not necessary to remove the cables from the faceplate of a line card if you plan to move the same line card to a different slot. However, check to be sure the cables are not run through the cable-management bracket before you remove the line card and cables.

It is not necessary to remove the cables if you are not replacing the card. If you are removing a line card that uses BNC cables, and are replacing the same type of card in the same slot, you do not need to remove the coaxial cables. If you are removing a line card that uses coaxial cables, and are not replacing the same type of card in the same slot, you must remove the coaxial cables from the BNC connectors.

Use the following procedure to remove a line card from the chassis:

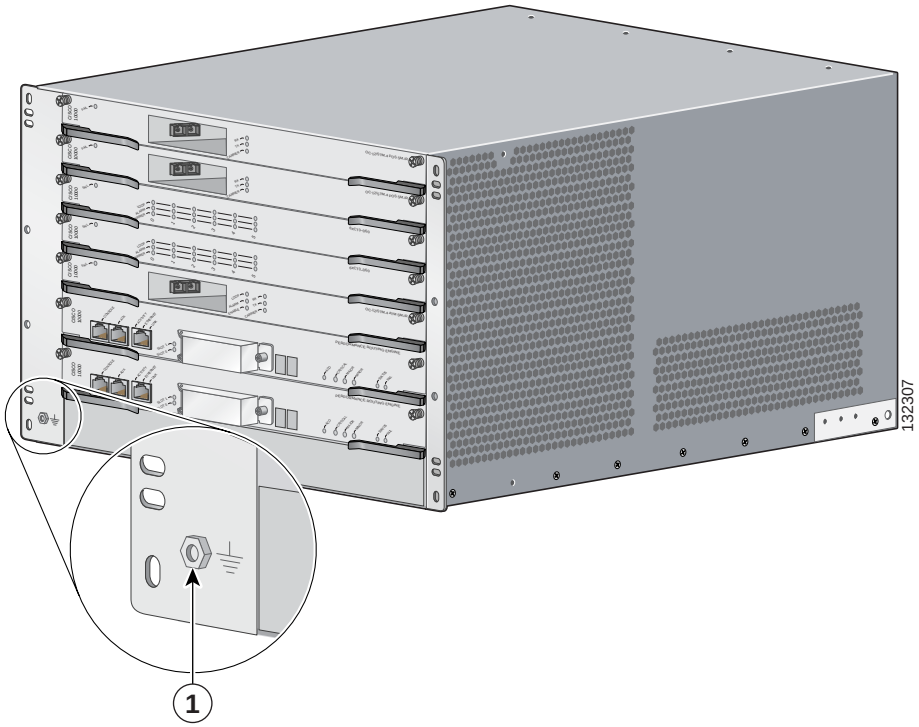
**Step 1** Attach an antistatic wrist strap to your wrist and to the ESD socket on the chassis, or to a bare metal surface on the chassis or frame (Figure 17-46 and Figure 17-47).

***Figure 17-46 ESD Connection—Cisco 10008 Router***




| | | |
|---|---|---|
| **1** | ESD socket | |

*Figure 17-47 ESD Chassis Connection—Cisco 10005 Router*

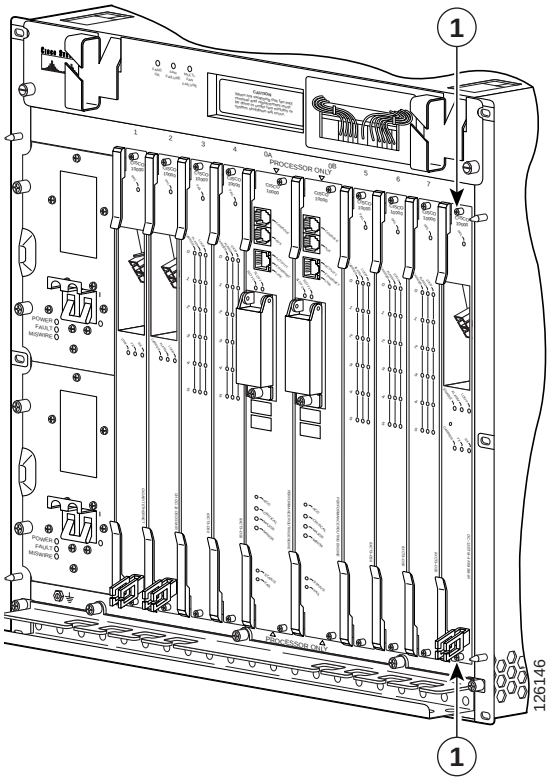



| | | |
|---|---|---|
| **1** | ESD socket | |

**Note** For illustration purposes, line cards are shown only being removed from the Cisco 10008 chassis.

**Step 2** Loosen the top and bottom captive screws on the line card (Figure 17-48).

***Figure 17-48 Captive Screw Locations***

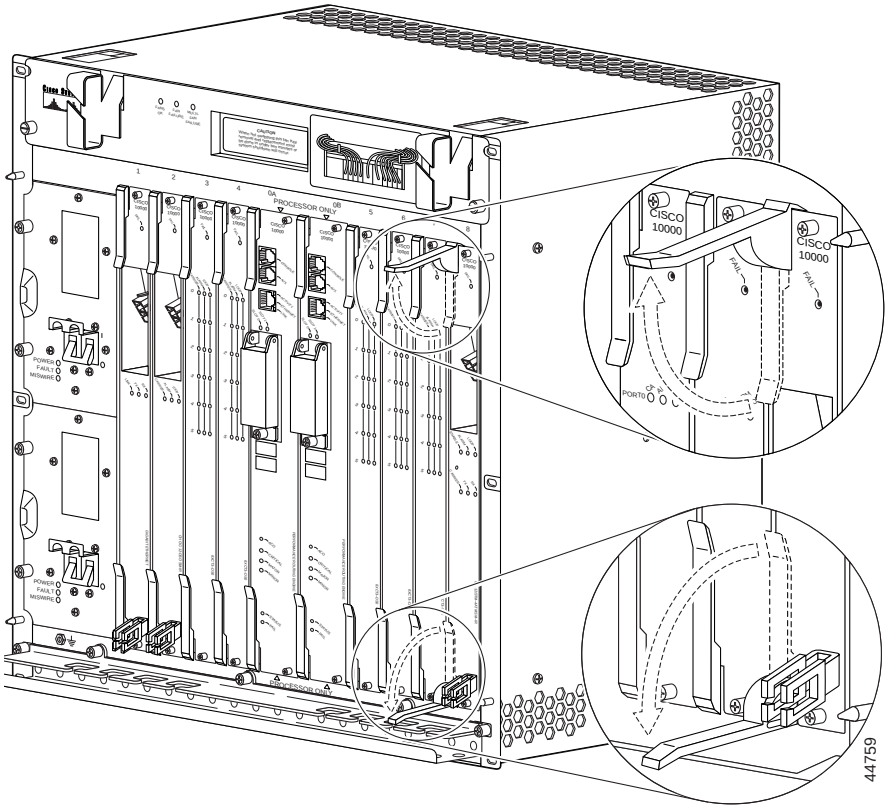



| | | |
|---|---|---|
| **1** | Captive screws | |

**Step 3** Simultaneously pivot both ejector levers away from each other to disengage the line card from the backplane (Figure 17-49).

**Step 4** Slide the line card out of the slot and place it on an antistatic surface, or in an antistatic bag.

***Figure 17-49 Opening the Ejector Levers***




**Step 5** See the "Installing Full-Size Line Cards" section on page 17-10 for instructions to install a new line card.

If you are not installing a replacement line card, install a blank faceplate in the slot.

**Warning** **Do not operate the system unless all slots contain a line card or a blank faceplate. Blank faceplates are necessary in empty slots to prevent exposure to hazardous voltages, to reduce electromagnetic interference (EMI) that may disrupt other equipment, and to direct the flow of cooling air through the chassis.** Statement 156

If you have a Cisco 10005 chassis, and a line card using BNC connectors, see Appendix A, "Cisco 10005 Extender Card Information" for information on removing the extender card.

# Removing Half-Height Line Cards and Carrier

This section describes how to properly remove half-height line cards and the carrier from the chassis (for purposes of updating or upgrading to a new line card). This section includes the following tasks:


- Removing a Half-Height Line Card, page 17-51
- Removing a Carrier, page 17-55


## Removing a Half-Height Line Card

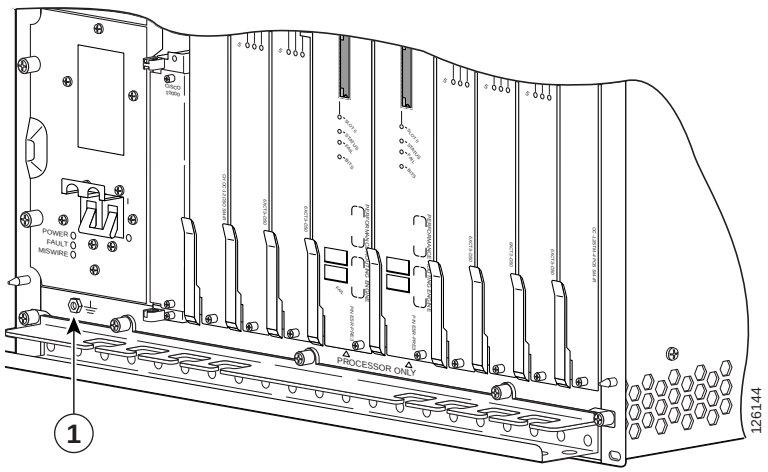
**Note** You need not remove the cables from the faceplate of a line card if you are going to move the same line card to a different slot. However, check to be sure the dales are not run through the cable-management bracket before you remove the half-height line card and cables.

You do need to remove the cables if you are not replacing the card. If you are removing a line card that uses BNC cables, and are replacing the same type of card in the same slot, you do not need to remove the coaxial cables. If you are removing a line card that uses coaxial cables, and are not replacing the same type of card in the same slot, you must remove the coaxial cables from the BNC connectors.

**Step 1** Attach an antistatic wrist strap to your wrist and to the ESD socket on the chassis, or to a bare metal surface on the chassis or frame (Figure 17-50 or Figure 17-51).

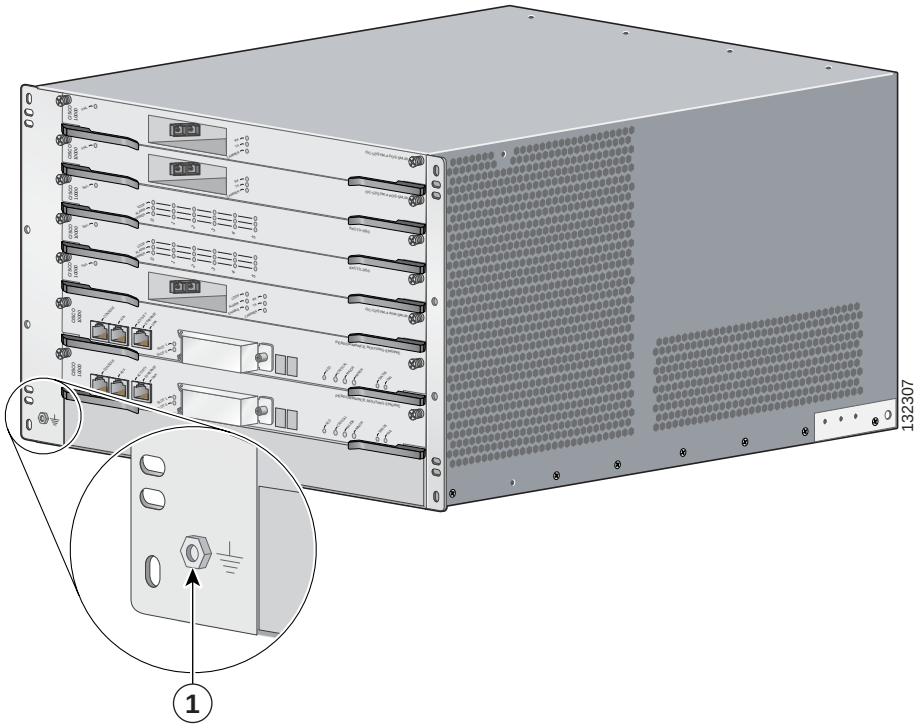
Use the following procedure to remove a half-height line card from the chassis:

***Figure 17-50 ESD Connection—Cisco 10008 Router***




| | | |
|---|---|---|
| 1 | ESD socket | |

*Figure 17-51 ESD Connection—Cisco 10005 Router*



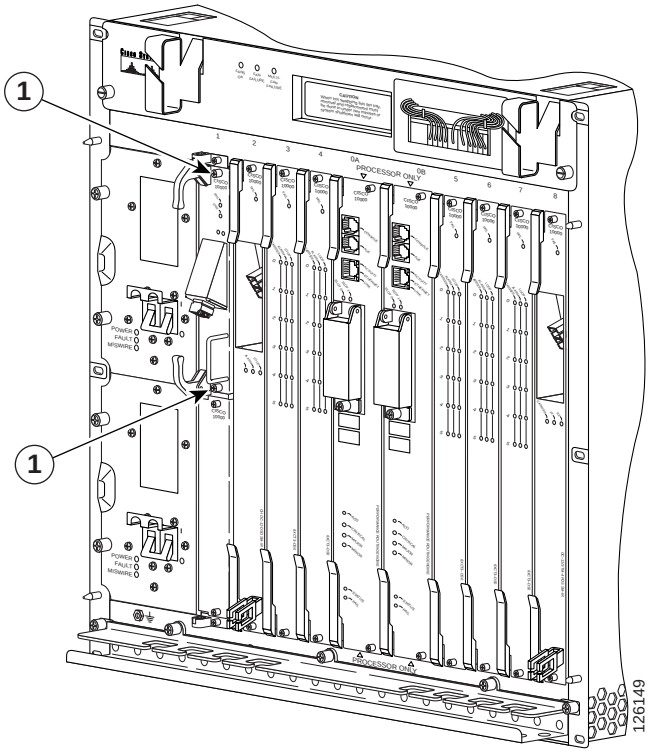

| | | |
|---|---|---|
| **1** | ESD socket | |

**Note** For illustration purposes, half-height line cards are only shown being removed from the Cisco 10008 chassis.

**Step 2** Disconnect any network cables connected to the line card port.

**Step 3** Loosen the top and bottom captive screws until they disengage and spring away from the faceplate (Figure 17-52).

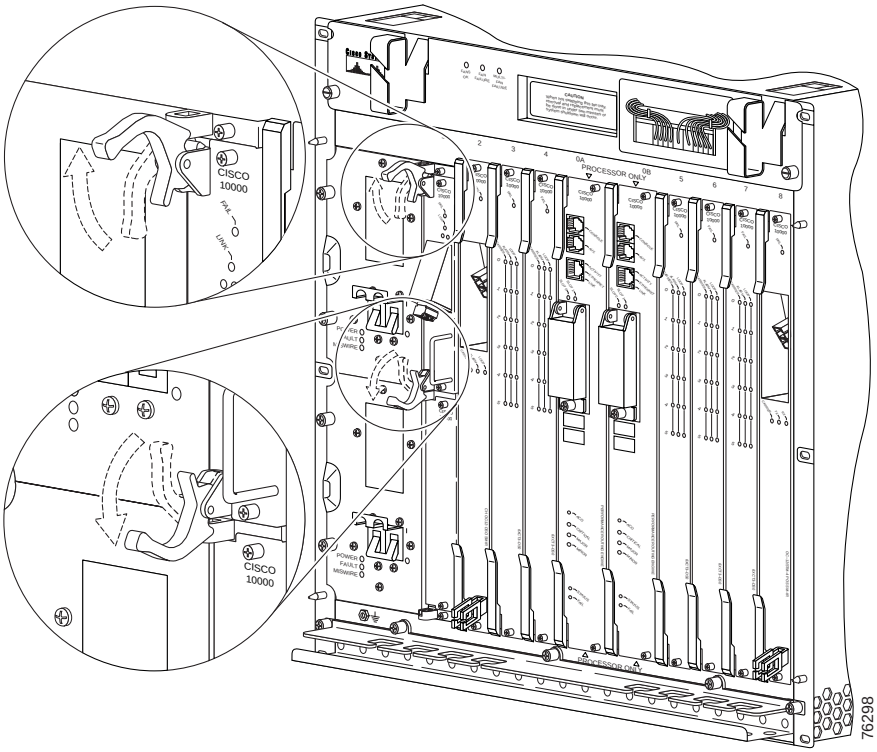
***Figure 17-52 Captive Screw Locations***




| | | |
|---|---|---|
| **1** | Captive screw | |

**Step 4** Simultaneously pivot both ejector levers away from each other to disengage the line card from the backplane (Figure 17-53).

***Figure 17-53 Opening the Ejector Levers***




**Step 5** Slide the line card out of the carrier and place it on an antistatic surface or in an antistatic bag.

**Step 6** If you are not installing a replacement line card, install a blank faceplate in the slot.

**Caution** Do not install two carrier half-height blank faceplates into a line card slot. Instead, install a full-slot blank faceplate into the slot. The half-height blank faceplates do not have air dams, and the empty slot will rob cooling air from the other slots. A carrier with one half-height line card and one half-height blank faceplate is allowed.

**Warning** **Do not operate the system unless all slots contain a line card or a blank faceplate. Do not use a carrier with no line cards; you must install a full-slot blank faceplate into slots that contain no cards. Blank faceplates are necessary in empty slots to prevent exposure to hazardous voltages, to reduce electromagnetic interference (EMI) that may disrupt other equipment, and to direct the flow of cooling air through the chassis.** Statement 156

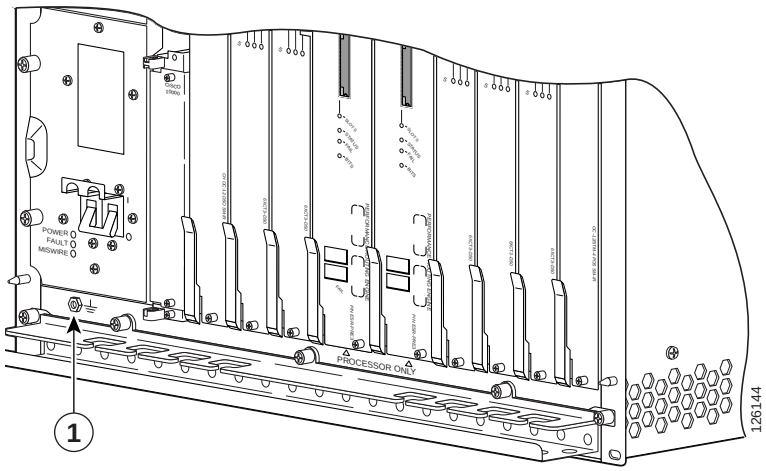
# Removing a Carrier

Use the following procedure to remove a carrier from the chassis:

**Warning** **All safety requirements and recommendations must be read by all personnel prior to working on the system. Failure to follow the safety requirements and recommendations could result in injury.** Statement 297

**Step 1** Attach an antistatic wrist strap to your wrist and to the ESD socket on the chassis, or to a bare metal surface on the chassis or frame (Figure 17-54).

***Figure 17-54 ESD Chassis Connection***




| | | |
|---|---|---|
| 1 | ESD socket | |

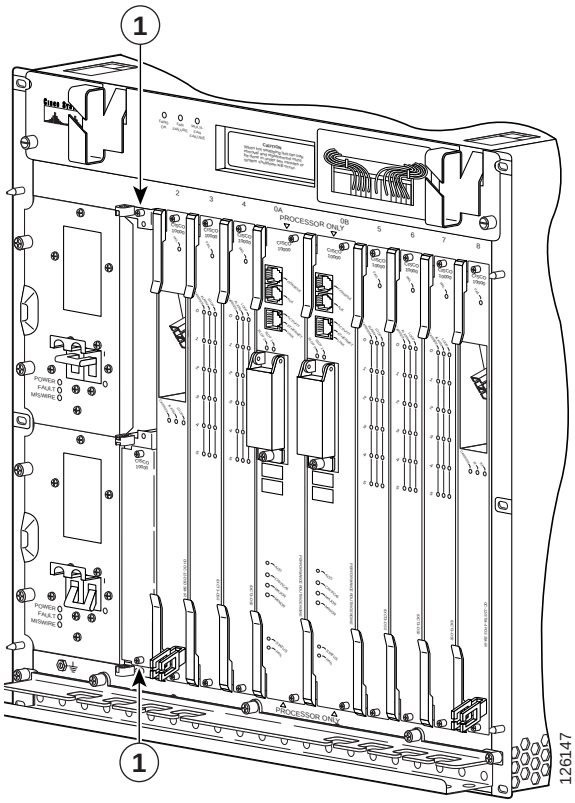
**Note** The carrier does not have ejector levers to disengage cards from the backplane, so you must remove any line cards before you remove the carrier.

**Caution** Do not remove the carrier with line cards installed.

**Step 2** Remove any line cards from the carrier according to the "Removing a Half-Height Line Card" section on page 17-51.

**Step 3** Loosen the top and bottom captive screws on the carrier (Figure 17-55).

*Figure 17-55 Captive Screw Locations*



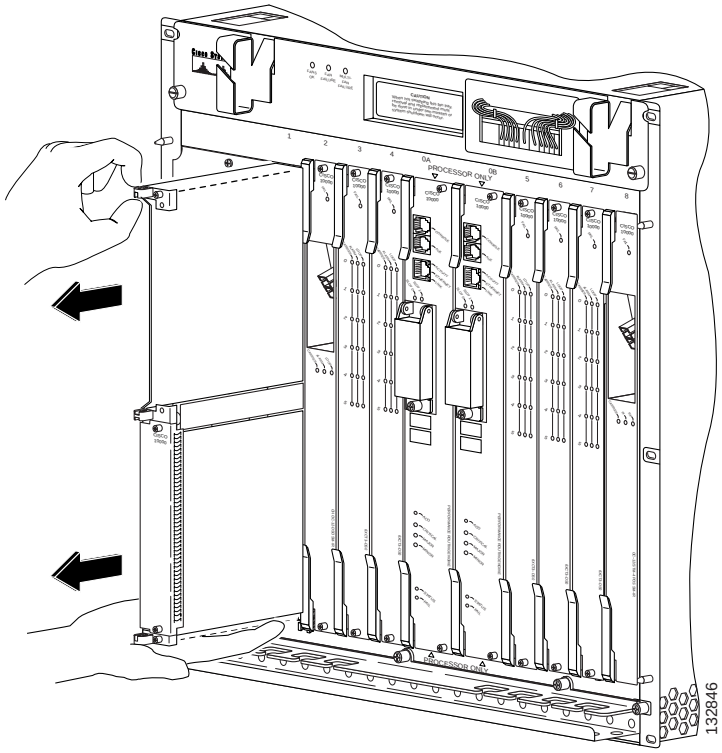

| | | |
|---|---|---|
| **1** | Captive screws | |

**Step 4** Grasp the top and bottom carrier captive screws and pull the carrier free from the backplane.

**Step 5** Once partially removed, place one hand beneath the carrier to steady it as you pull it complete free of the chassis.

**Step 6** Slide the carrier out of the slot (Figure 17-56).

***Figure 17-56 Removing the Carrier from the Chassis***




**Step 7** If you are not installing a replacement carrier or a line card, install a full-slot blank faceplate in the slot.

**Warning** **Do not operate the system unless all slots contain a line card or a blank faceplate. Do not use a carrier with no line cards; you must install a full-slot blank faceplate into slots that contain no cards. Blank faceplates are necessary in empty slots to prevent exposure to hazardous voltages, to reduce electromagnetic interference (EMI) that may disrupt other equipment, and to direct the flow of cooling air through the chassis.** Statement 156

# Checking the Installation

Refer to the overview section of each chapter for LED information.

This section describes the procedures you can use to verify the line card installation, and includes information on the following topics:


- Using show Commands to Verify Line Card Status, page 17-58
- Using show Commands to Display Line Card Information, page 17-59
- Using the ping Command to Verify Network Connectivity, page 17-59


If you experience other problems that you are unable to solve, contact Cisco Technical Support (see the "Obtaining Documentation, Obtaining Support, and Security Guidelines" section on page -xix) or a service representative for assistance.

To configure the new interface, use the *Cisco 10000 Series Router Line Card Configuration Guide*.

## Using show Commands to Verify Line Card Status

**Note** Using the **show** commands for interface information is viable only if the line cards have already been configured.

The following procedure uses **show** commands to verify that the line card is configured and operating correctly.

**Step 1** Use the **show version** command to display the system hardware configuration. Ensure that the list includes the new line card.

**Step 2** Display all the current line cards with the **show controllers** command. Verify that the line card appears in the correct line card slot.

**Step 3** Specify the new line card with the **show interfaces** *type slot-number/subslot/port-number* command and verify that the first line of the display specifies the line card with the correct slot number. Also verify that the line card and line protocol are in the correct state: up or down.

**Step 4** Display the protocols configured for the entire system and specific line cards with the **show protocols** command. If necessary, return to configuration mode to add or remove protocol routing on the system or specific line cards.

**Step 5** Display the running configuration file with the **show running-config** command. Verify that the configuration is accurate for the system and each line card.

If the line card is down and you configured it as up, or if the displays indicate that the hardware is not functioning properly, ensure that the network interface is properly connected and terminated. If you still have problems bringing the line card up, contact a service representative for assistance.

# Using show Commands to Display Line Card Information

Table 17-3 describes the **show** commands you can use to display line card information.

**Note** Using the **show** commands for interface information is viable only if the line cards have already been configured.

***Table 17-3 show Commands to Display Line Card Information***

| Command | Type of Information Provided | Example |
|---|---|---|
| **show controllers** *type slot-number/subslot/port-number* | Network link status, register contents, and controller chip errors. | **show controllers fastethernet 3/0/0** |
| **show interfaces** *type slot-number/subslot/port-number* | Line status and data link protocol status for a particular line card port. Statistics about data traffic sent and received by the port. | **show interfaces fastethernet 2/0/0** |
| **show diag** *slot/subslot* | Line card type in that slot, number of ports, hardware revision, part number, and EEPROM contents. | **show diag 4/0** |
| **show version** | Cisco IOS software version, names and sources of configuration files, and boot images. | **show version** |

# Using the ping Command to Verify Network Connectivity

The **ping** command allows you to verify that a line card is functioning properly and to check the path between a specific port and connected devices at various locations on the network. After you verify that the system has booted successfully and is operational, you can use this command to verify the status of the line card ports. Refer to the publications listed in the "Related Documentation" section on page -xix for detailed command descriptions and examples.

**Note** The interfaces must be configured correctly or the **ping** command will not work.

The **ping** command sends an echo request out to a remote device at an IP address that you specify. After sending a series of signals, the command waits a specified time for the remote device to echo the signals. Each returned signal is displayed as an exclamation point (!) on the console terminal; each signal that is not returned before the specified timeout is displayed as a period (.). A series of exclamation points (!!!!!) indicates a good connection; a series of periods (.....) or the messages [timed out] or [failed] indicate that the connection failed.

Following is an example of a successful **ping** command to a remote server with the IP address 10.1.1.60:

```
Router# ping 10.1.1.60 <Return>
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 10.1.1.60, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/15/64 ms
Router#
```

If the connection fails, verify that you have the correct IP address for the server and that the server is active (powered on), and repeat the **ping** command.

# Configuring a Line Card

Preprovisioning a line card slot downloads software to the line card slot for the line card you are planning to install. Preprovisioning allows you to prepare in advance a complete configuration for the line card, including items you normally need to configure after initially configuring the line card, such as PVCs under an ATM line card or VLANs under an Ethernet line card.

Resetting a line card reloads line card software without having to manually insert and remove the line card.

After the line card is successfully installed, configure the card for network use. For information about configuring line cards, including information about preprovisioning the line card slot and resetting the line card, see the *Cisco 10000 Series Router Line Card Configuration Guide*.

**Note** It i s not necessary to configure the line card if you perform a replacement installation in the same chassis slot. The system automatically downloads the necessary configuration information from the PRE.

# Troubleshooting the Installation

This chapter describes how to troubleshoot the installation of line cards on a Cisco 10000 series router and contains the following sections:


- ATM Line Card Troubleshooting Information, page 18-2
- Channelized Line Cards Troubleshooting Information, page 18-6
- Fast Ethernet and Gigabit Ethernet Line Card Troubleshooting Information, page 18-11
- Packet Over SONET Line Card Troubleshooting Information, page 18-20
- Unchannelized E3/T3 Line Card Troubleshooting Information, page 18-23
- Cleaning the Fiber-Optic Connections, page 18-24
- Checking Flow Control, page 18-24

# ATM Line Card Troubleshooting Information

Table 18-1 provides information on which symptom, possible cause, and corrective action apply to each of the ATM line cards.

***Table 18-1 ATM Line Card Troubleshooting Information***

| Symptom | Possible Cause | Corrective Action | OC-3/ STM-1 ATM | E3/ DS3 ATM | OC-12 ATM |
|---|---|---|---|---|---|
| The FAIL LED does not light when the line card is inserted into a slot. (The power on the line card has not turned on.) | The line card is not properly seated. | Be sure the ejector levers are closed and the captive screws tightened. | Y | Y | Y |
| | Bad line card connector or bad backplane connector. | 1. Carefully check both the line card backplane connector and chassis backplane connector for bent or damaged pins. If the line card has damaged pins, replace the line card. If the backplane connector has damaged pins, replace the chassis or temporarily move the line card to another slot.<br>2. Remove the line card and put it in another chassis slot. | | | |
| | Defective line card. | Replace the line card. | | | |
| | Chassis not powered on or PRE not in chassis. | Check that the chassis power supplies are turned on and that the PRE is powered up. | | | |
| The FAIL LED blinks at the rate of 10 times per second when the line card is inserted into a slot. (The line card has detected a slot parity error.) | The line card is not properly seated. | Be sure the ejector levers are closed and the captive screws tightened. | Y | Y | Y |
| | Bad line card connector or bad backplane connector. | 1. Carefully check both the line card backplane connector and chassis backplane connector for bent or damaged pins. If the line card has damaged pins, replace the line card. If the backplane connector has damaged pins, replace the chassis or temporarily move the line card to another slot.<br>2. Remove the line card and put it in another chassis slot. | | | |
| | Defective line card. | Replace the line card. | | | |

*Table 18-1 ATM Line Card Troubleshooting Information (continued)*

| Symptom | Possible Cause | Corrective Action | OC-3/ STM-1 ATM | E3/ DS3 ATM | OC-12 ATM |
|---|---|---|---|---|---|
| The FAIL LED blinks at a slower rate than 10 times per second when the line card is inserted into a slot. | The line card is experiencing an error while trying to boot and is either resetting itself or being reset by the PRE.<br>The line card has been recognized by Cisco IOS but is experiencing an issue while running functional code. | 1. Be sure the ejector levers are closed and the captive screws tightened.<br>2. Carefully check both the line card backplane connector and chassis backplane connector for bent or damaged pins. If the line card has damaged pins, replace the line card. If the backplane connector has damaged pins, replace the chassis or temporarily move the line card to another slot.<br>3. Remove the line card and put it in another chassis slot.<br>4. Replace the line card. | Y | Y | Y |
| The FAIL LED never turns off after the line card has been inserted. (The line card is not coming up out of reset.) | The line card is not properly seated. | Be sure the ejector levers are closed and the captive screws tightened. | Y | Y | Y |
| | Bad line card connector or bad backplane connector. | 1. Carefully check both the line card backplane connector and chassis backplane connector for bent or damaged pins. If the line card has damaged pins, replace the line card. If the backplane connector has damaged pins, replace the chassis or temporarily move the line card to another slot.<br>2. Remove the line card and put it in another chassis slot. | | | |
| | Cisco IOS is configured to hold the card in reset. | Verify that the slot is not being held in reset by the Cisco IOS configuration. | | | |
| | Defective line card. | Replace the line card. | | | |

*Table 18-1 ATM Line Card Troubleshooting Information (continued)*

| Symptom | Possible Cause | Corrective Action | OC-3/ STM-1 ATM | E3/ DS3 ATM | OC-12 ATM |
|---|---|---|---|---|---|
| With the optical fiber cable connected and the line card configured under Cisco IOS, the CARRIER LED does not illuminate. | The optical fiber cable is not seated correctly. | Unplug and replug the optical fiber cable. | Y | — | Y |
| | The optical fiber cable is plugged in backwards. | Verify that the transmit of the far end is plugged into the receive of the Cisco 10000 equipment and vice versa. | | | |
| | The optical fiber cable is dirty. | Clean the optical fiber cable on both ends. See the "Cleaning the Fiber-Optic Connections" section on page 18-24. | | | |
| | The equipment at the far end of the optical fiber cable is not operational. | Verify that the far end is enabled and actively sending a signal down the optical fiber cable. | | | |
| | The optical fiber cable is the incorrect type. | Use the correct type of the optical fiber cable for the line card. | | | |
| | Far-end optics do not match the line card optics. | Make sure the far-end optics match the line card optics. | | | |
| | The optical fiber cable is too long. | If the optical fiber cable being used is longer than the standards allow, use a standards-compliant length of optical fiber cable for the line card. | | | |
| | The optical fiber cable is too short. | If the optical fiber cable is too short, the optical receiver can be overpowered. Use an attenuator or a longer optical fiber cable to adjust the optical power seen at the Cisco 10000 line card. Be sure to calculate the optical power budget. | | | |
| | The optical fiber cable is broken. | As an experiment to isolate the failure, use a small loopback cable to connect the Cisco 10000 line card to itself. If the LED lights under this condition, continue to investigate cable or far-end equipment failure. Try replacing the optical fiber cable. | | | |
| | Defective. line card. | Replace the line card. | | | |

*Table 18-1 ATM Line Card Troubleshooting Information (continued)*

| Symptom | Possible Cause | Corrective Action | OC-3/ STM-1 ATM | E3/ DS3 ATM | OC-12 ATM |
|---|---|---|---|---|---|
| With the BNC cable connected and the line card configured under Cisco IOS, the CARRIER LED does not illuminate. | The cable is not seated correctly. | Unplug and replug the cable. | — | Y | — |
| | The cable is plugged in backward. | Verify that the transmit of the far end is plugged into the receive of the Cisco 10000 equipment and vice versa. | | | |
| | The equipment at the far end of the cable is not operational. | Verify that the far end is enabled and actively sending a signal down the cable. | | | |
| | The cable is broken. | As an experiment to isolate the failure, use a small loopback cable to connect the Cisco 10000 line card to itself. If the LED lights under this condition, continue to investigate cable or far-end equipment failure. Try replacing the cable. | | | |
| | Defective line card. | Replace the line card. | | | |

# Channelized Line Cards Troubleshooting Information

Table 18-2 provides information on which symptom, possible cause, and corrective action apply to each of the Channelized line cards.

***Table 18-2 Channelized Line Card Troubleshooting Information***

| Symptom | Possible Cause | Corrective Action | Ch. T3 HH | Ch. E1/T1 | Ch. OC-12/ STM-4 | Ch. OC-3/ STM-1 | Ch. T3 |
|---|---|---|---|---|---|---|---|
| The FAIL LED does not light when the line card is inserted into a slot. (The power on the line card has not turned on.) | The line card is not properly seated. | Be sure the ejector levers are closed and the captive screws tightened. | Y | Y | Y | Y | Y |
| | Bad line card connector or bad backplane connector. | 1. Carefully check both the line card backplane connector and chassis backplane connector for bent or damaged pins. If the line card has damaged pins, replace the line card. If the backplane connector has damaged pins, replace the chassis or temporarily move the line card to another slot.<br>2. Remove the line card and put it in another chassis slot. | | | | | |
| | Defective line card. | Replace the line card. | | | | | |
| | Chassis not powered on or PRE not in chassis. | Check that the chassis power supplies are turned on and that the PRE is powered up. | | | | | |
| The FAIL LED blinks at the rate of 10 times per second when the line card is inserted into a slot. (The line card has detected a slot parity error.) | The line card is not properly seated. | Be sure the ejector levers are closed and the captive screws tightened. | Y | Y | Y | Y | Y |
| | Bad line card connector or bad backplane connector. | 1. Carefully check both the line card backplane connector and chassis backplane connector for bent or damaged pins. If the line card has damaged pins, replace the line card. If the backplane connector has damaged pins, replace the chassis or temporarily move the line card to another slot.<br>2. Remove the line card and put it in another chassis slot. | | | | | |
| | Defective line card. | Replace the line card. | | | | | |

*Table 18-2 Channelized Line Card Troubleshooting Information*

| Symptom | Possible Cause | Corrective Action | Ch. T3 HH | Ch. E1/T1 | Ch. OC-12/ STM-4 | Ch. OC-3/ STM-1 | Ch. T3 |
|---|---|---|---|---|---|---|---|
| The FAIL LED blinks at a slower rate than 10 times per second when the line card is inserted into a slot. | The line card is experiencing an error while trying to boot and is either resetting itself or being reset by the PRE.<br>The line card has been recognized by Cisco IOS but is experiencing an issue while running functional code. | 1. Be sure the ejector levers are closed and the captive screws tightened.<br>2. Carefully check both the line card backplane connector and chassis backplane connector for bent or damaged pins. If the line card has damaged pins, replace the line card. If the backplane connector has damaged pins, replace the chassis or temporarily move the line card to another slot.<br>3. Remove the line card and put it in another chassis slot.<br>4. Replace the line card. | Y | Y | Y | Y | Y |
| The FAIL LED never turns off after the line card has been inserted. (The line card is not coming up out of reset.) | The line card is not properly seated. | Be sure the ejector levers are closed and the captive screws tightened. | Y | Y | Y | Y | Y |
| | Bad line card connector or bad backplane connector. | 1. Carefully check both the line card backplane connector and chassis backplane connector for bent or damaged pins. If the line card has damaged pins, replace the line card. If the backplane connector has damaged pins, replace the chassis or temporarily move the line card to another slot.<br>2. Remove the line card and put it in another chassis slot. | | | | | |
| | Cisco IOS is configured to hold the card in reset. | Verify that the slot is not being held in reset by the Cisco IOS configuration. | | | | | |
| | Defective line card. | Replace the line card. | | | | | |

*Table 18-2 Channelized Line Card Troubleshooting Information*

| Symptom | Possible Cause | Corrective Action | Ch. T3 HH | Ch. E1/T1 | Ch. OC-12/ STM-4 | Ch. OC-3/ STM-1 | Ch. T3 |
|---|---|---|---|---|---|---|---|
| T3 level LOOP LED is blinking. | This LED blinks on line cards that are in standby mode as part of a pair of redundant line cards.<br>An active line card will set these LEDs to off, unless a T3 level loopback is initiated on the port. | 1. No action is required if the line card in a redundant pair is supposed to be in standby mode.<br>2. If the line card in a redundant pair is supposed to be active and the T3 level LOOP LED is blinking:<br>a. Remove the standby line card.<br>b. Remove and reinsert the active line card.<br>c. Replace the active line card. | Y | N | N | N | N |
| With the optical fiber cable connected and the line card configured under Cisco IOS, the CARRIER LED does not illuminate. | The optical fiber cable is not seated correctly. | Unplug and replug the optical fiber cable. | Y | — | Y | — | — |
| | The optical fiber cable is plugged in backwards. | Verify that the transmit of the far end is plugged into the receive of the Cisco 10000 equipment and vice versa. | | | | | |
| | The optical fiber cable is dirty. | Clean the optical fiber cable on both ends. See the "Cleaning the Fiber-Optic Connections" section on page 18-24. | | | | | |
| | The equipment at the far end of the optical fiber cable is not operational. | Verify that the far end is enabled and actively sending a signal down the optical fiber cable. | | | | | |
| | The optical fiber cable is the incorrect type. | Use the correct type of the optical fiber cable for the line card. | | | | | |
| | Far-end optics do not match the line card optics. | Make sure the far-end optics match the line card optics. | | | | | |
| | The optical fiber cable is too long. | If the optical fiber cable being used is longer than the standards allow, use a standards-compliant length of optical fiber cable for the line card. | | | | | |
| | The optical fiber cable is too short. | If the optical fiber cable is too short, the optical receiver can be overpowered. Use an attenuator or a longer optical fiber cable to adjust the optical power seen at the Cisco 10000 line card. Be sure to calculate the optical power budget. | | | | | |

*Table 18-2 Channelized Line Card Troubleshooting Information*

| Symptom | Possible Cause | Corrective Action | Ch. T3 HH | Ch. E1/T1 | Ch. OC-12/ STM-4 | Ch. OC-3/ STM-1 | Ch. T3 |
|---|---|---|---|---|---|---|---|
| | The optical fiber cable is broken. | As an experiment to isolate the failure, use a small loopback cable to connect the Cisco 10000 line card to itself. If the LED lights under this condition, continue to investigate cable or far-end equipment failure. Try replacing the optical fiber cable. | Y | — | Y | — | — |
| | Defective line card. | Replace the line card. | | | | | |
| With the BNC cable connected and the line card configured under Cisco IOS, the CARRIER LED does not illuminate. | The cable is not seated correctly. | Unplug and replug the cable. | Y | — | — | — | Y |
| | The cable is plugged in backward. | Verify that the transmit of the far end is plugged into the receive of the Cisco 10000 equipment and vice versa. | | | | | |
| | The equipment at the far end of the cable is not operational. | Verify that the far end is enabled and actively sending a signal down the cable. | | | | | |
| | The cable is broken. | As an experiment to isolate the failure, use a small loopback cable to connect the Cisco 10000 line card to itself. If the LED lights under this condition, continue to investigate cable or far-end equipment failure. Try replacing the cable. | | | | | |
| | Defective line card. | Replace the line card. | | | | | |

*Table 18-2 Channelized Line Card Troubleshooting Information*

| Symptom | Possible Cause | Corrective Action | Ch. T3 HH | Ch. E1/T1 | Ch. OC-12/ STM-4 | Ch. OC-3/ STM-1 | Ch. T3 |
|---|---|---|---|---|---|---|---|
| With the RJ-45 cable connected and the line card configured under Cisco IOS, the CARRIER LED does not illuminate. | The cable is not seated correctly. | Unplug and replug the cable. | — | Y | — | — | — |
| | Connected to the far end with an RJ-45 straight-through connector instead of a cross-over cable. | If you are using a straight-through cable, replace it with an RJ-45 cable. | | | | | |
| | The equipment at the far end of the cable is not operational. | Verify that the far end is enabled and is actively sending a signal down the cable. | | | | | |
| | The cable is broken. | As an experiment to isolate the failure, use a small loopback cable to connect the Cisco 10000 line card to itself. If the LED lights under this condition, continue to investigate cable or far-end equipment failure. Try replacing the cable. | | | | | |
| | Defective line card. | Replace the line card. | | | | | |

# Fast Ethernet and Gigabit Ethernet Line Card Troubleshooting Information

Table 18-3 provides information on which symptom, possible cause, and corrective action apply to each of the Fast Ethernet and Gigabit Ethernet line cards. Table 18-4 provides SFP module software messages shown when SFP modules are missing, incorrectly inserted, or incorrect technology SFP modules are inserted in the 1-Port Gigabit Ethernet Half-Height line card.

***Table 18-3 Troubleshooting Fast Ethernet and Gigabit Ethernet Line Cards***

| Symptom | Possible Cause | Corrective Action | Fast Ethernet | Gigabit Ethernet Half Height | Gigabit Ethernet |
|---|---|---|---|---|---|
| The FAIL LED does not light when the line card is inserted into a slot. | The line card is not properly seated. | Be sure the ejector levers are closed and the captive screws tightened. | Y | Y | Y |
| | Bad line card connector or bad backplane connector. | 1. Carefully check both the line card backplane connector and chassis backplane connector for bent or damaged pins. If the line card has damaged pins, replace the line card. If the backplane connector has damaged pins, replace the chassis or temporarily move the line card to another slot.<br>2. Remove the line card and put it in another chassis slot. | | | |
| | Defective line card. | Replace the line card. | | | |
| | Chassis not powered on or PRE not in chassis. | Check that the chassis power supplies are turned on and that the PRE is powered up. | | | |

*Table 18-3 Troubleshooting Fast Ethernet and Gigabit Ethernet Line Cards (continued)*

| Symptom | Possible Cause | Corrective Action | Fast Ethernet | Gigabit Ethernet Half Height | Gigabit Ethernet |
|---|---|---|---|---|---|
| The FAIL LED blinks at the rate of 10 times per second when the line card is inserted into a slot. | The line card is not properly seated. | Be sure the ejector levers are closed and the captive screws tightened. | Y | Y | Y |
| | Bad line card connector or bad backplane connector. | 1. Carefully check both the line card backplane connector and chassis backplane connector for bent or damaged pins. If the linecard has damaged pins, replace the line card. If the backplane connector has damaged pins, replace the chassis or temporarily move the line card to another slot.<br>2. Remove the line card and put it in another chassis slot. | | | |
| | Defective line card. | Replace the line card. | | | |
| The FAIL LED blinks at a slower rate than 10 times per second when the line card is inserted into a slot. | The line card is experiencing an error while trying to boot and is either resetting itself or being reset by the PRE.<br>The line card has been recognized by Cisco IOS but is experiencing an issue while running functional code. | 1. Be sure the ejector levers are closed and the captive screws tightened.<br>2. Carefully check both the line card backplane connector and chassis backplane connector for bent or damaged pins. If the line card has damaged pins, replace the line card. If the backplane connector has damaged pins, replace the chassis or temporarily move the line card to another slot.<br>3. Remove the line card and put it in another chassis slot.<br>4. Replace the line card. | Y | Y | Y |

*Table 18-3 Troubleshooting Fast Ethernet and Gigabit Ethernet Line Cards (continued)*

| Symptom | Possible Cause | Corrective Action | Fast Ethernet | Gigabit Ethernet Half Height | Gigabit Ethernet |
|---|---|---|---|---|---|
| The FAIL LED never turns off after the line card has been inserted. (The line card is not coming up out of reset.) | The line card is not properly seated. | Be sure the ejector levers are closed and the captive screws tightened. | Y | Y | Y |
| | Bad line card connector or bad backplane connector. | 1. Carefully check both the line card backplane connector and chassis backplane connector for bent or damaged pins. If the line card has damaged pins, replace the line card. If the backplane connector has damaged pins, replace the chassis or temporarily move the line card to another slot.<br>2. Remove the line card and put it in another chassis slot. | | | |
| | Cisco IOS is configured to hold the card in reset. | Verify that the slot is not being held in reset by the Cisco IOS configuration. | | | |
| | Defective line card. | Replace the line card. | | | |
| The FAIL LED blinks after the line card has been recognized in Cisco IOS. | The SFP module has been rejected because: | 1. Remove and reseat the SFP module.<br>2. Replace the SFP module. | — | Y | — |
| | An internal fault is detected.<br>Wrong type of SFP module; not a Gigabit Ethernet SFP module.<br>Two SFP modules with identical serial numbers are present in the system. | | | | |
| | Not a Cisco SFP module. | Replace with a Cisco Gigabit Ethernet SFP module. | | | |
| The FAIL LED blinks after the line card has been recognized in Cisco IOS. | The GBIC module has been rejected because an internal fault has been detected. | Replace with a Cisco Gigabit Ethernet GBIC module. | — | — | Y |

*Table 18-3 Troubleshooting Fast Ethernet and Gigabit Ethernet Line Cards (continued)*

| Symptom | Possible Cause | Corrective Action | Fast Ethernet | Gigabit Ethernet Half Height | Gigabit Ethernet |
|---|---|---|---|---|---|
| With the cable connected and the line card configured under Cisco IOS, the LINK LED does not illuminate. | The cable is not seated correctly. | Unplug and replug the cable. | — | Y | Y |
| | The optical fiber cable is plugged in backwards. | Verify that the transmit of the far end is plugged into the receive of the Cisco 10000 equipment and vice versa. | | | |
| | The GBIC module or SFP module was not fully inserted or was seated improperly. | Reinstall the GBIC module or SFP module. | | | |
| | The optical fiber cable is dirty. | Clean the fiber on both ends. See the "Cleaning the Fiber-Optic Connections" section on page 18-24. | | | |
| | The equipment at the far end of the optical fiber cable is not operational. | Verify that the far end is enabled and actively sending a signal down the cable. | | | |
| | The equipment at the far end is shut down. | Enable the far end port. | | | |
| | Negotiation is not configured properly. | Reconfigure negotiation on both sides. | | | |
| | The port is shutdown. | Enable the port. | | | |
| | The optical fiber cable is the incorrect type. | Use the correct type of optical fiber cable for GBIC module or SFP module installed. | | | |
| | Far-end optics do not match the line card optics. | Make sure the far-end optics match the optics being used on the Cisco 10000 line card. | | | |
| | The optical fiber cable is too long. | If the optical fiber cable is longer than the standards allow, use a standards-compliant length of optical fiber cable for the GBIC module or SFP module being used. | | | |

*Table 18-3 Troubleshooting Fast Ethernet and Gigabit Ethernet Line Cards (continued)*

| Symptom | Possible Cause | Corrective Action | Fast Ethernet | Gigabit Ethernet Half Height | Gigabit Ethernet |
|---|---|---|---|---|---|
| (*continued*) With the cable connected and the line card configured under Cisco IOS, the LINK LED does not illuminate. | The optical fiber cable is too short. | If the optical fiber cable is too short, the optical receiver can be overpowered. Use an attenuator or a longer optical fiber cable to adjust the optical power seen at the Cisco 10000 line card. | — | Y | Y |
| | The optical fiber cable is broken. | As an experiment to isolate the failure, use a small loopback cable to connect the Cisco 10000 line card to itself. If the LED lights under this condition, continue to investigate cable and far end equipment failure. Try replacing the optical fiber cable. | | | |
| | Defective line card. | Replace the line card. | | | |
| With the optical fiber cable connected and the line card configured under Cisco IOS, the LINK LED blinks. | The cable is not seated correctly. | Unplug and replug the optical fiber cable. | — | Y | Y |
| | The GBIC module or SFP module is not fully inserted or is seated improperly. | Reinstall the GBIC module or SFP module. | | | |
| | The optical fiber cable is dirty. | Clean the optical fiber cable at both ends. See the "Cleaning the Fiber-Optic Connections" section on page 18-24. | | | |
| | The equipment at the far end is not operational. | Verify that the far end is enabled and actively sending a signal down the cable. | | | |
| | The equipment at the far end is shut down. | Enable the far end port. | | | |
| | Negotiation is not configured properly. | Reconfigure negotiation on both sides. If negotiation is configured incorrectly, the Cisco 10000 will enable and disable the laser as it attempts to negotiate with the far end. | | | |
| | The port is shutdown. | Enable the port. | | | |

*Table 18-3 Troubleshooting Fast Ethernet and Gigabit Ethernet Line Cards (continued)*

| Symptom | Possible Cause | Corrective Action | Fast Ethernet | Gigabit Ethernet Half Height | Gigabit Ethernet |
|---|---|---|---|---|---|
| With the optical fiber cable connected and the line card configured under Cisco IOS, the LINK LED blinks.(*continued*) | The optical fiber cable is the incorrect type. | Use the correct type of optical fiber cable for the type of GBIC module or SFP module installed. | — | Y | Y |
| | The far-end optics do not match the line card optics. | Make sure the far-end optics match the optics on the line card. | | | |
| | The optical fiber cable is too long. | If the optical fiber cable is longer than the standards allow, use a standards-compliant length of optical fiber cable for the GBIC module or SFP module being used. | | | |
| | The fiber optical cable is too short. | If the optical fiber cable is too short, the optical receiver can be overpowered. Use an attenuator or a longer optical fiber cable to adjust the optical power seen at the Cisco 10000 line card. | | | |
| | The optical fiber cable is broken. | As an experiment to isolate the failure, use a small loopback cable to connect the Cisco 10000 line card to itself. If the LED lights under this condition, continue to investigate cable and far end equipment failure. Try replacing the optical fiber cable. | | | |
| | Defective line card | Replace the line card. | | | |

*Table 18-3 Troubleshooting Fast Ethernet and Gigabit Ethernet Line Cards (continued)*

| Symptom | Possible Cause | Corrective Action | Fast Ethernet | Gigabit Ethernet Half Height | Gigabit Ethernet |
|---|---|---|---|---|---|
| With the RJ-45 cable connected and the line card configured under Cisco IOS, the LINK LED does not illuminate. | The cable is not seated correctly. | Unplug and replug the optical fiber cable. | Y | — | — |
| | Wrong cable used; straight-through cable rather than RJ-45 cross-over cable, or vice versa. | If you are using a straight-through cable, replace it with an RJ-45 cross-over cable. Make sure that the far end is configured correctly for the type of cable being used. | | | |
| | The equipment at the far end is not operational. | Verify that the far end is enabled and actively sending a signal down the cable. | | | |
| | Port duplex and speed settings are not configured properly. | Check the speed and duplex settings using the **show interface** command to be sure they match on both sides. You can set autonegotiation to full and half duplex. (Autonegotation may not be able to be set for the card on the other end, if autonegotiation is not supported on that card.) | | | |
| | The port is shutdown. | Enable the port. | | | |
| | The cable is broken. | As an experiment to isolate the failure, use a small loopback cable to connect the Cisco 10000 line card to itself. If the LED lights under this condition, continue to investigate cable and far-end equipment failure. Try replacing the cable. | | | |
| | Defective line card. | Replace the line card. | | | |

Different messages are generated in software when SFP modules are missing or are incorrect, are installed or removed from the 1-Port Gigabit Ethernet Half-Height line card. Use Table 18-4 to determine the meaning of specific messages. You can view the alarm messages using the **show facility-alarm status** command.

All the messages are displayed at the console automatically if console logging is configured to a level 6 or greater. The message label shows the minimum logging level necessary to view a given message: C10K_ALARM-6-INFO, for example, requires level 6 or greater.

*Table 18-4 SFPs and Cisco IOS Console Messages*

| Situation | Response/Description | Console Message |
|---|---|---|
| No SFP module in the system when Cisco IOS is loaded. | The FAIL LED is not blinking | %C10K_ALARM-6-INFO: ASSERT CRITICAL GigE1H 3/0/0 Physical Port Link Down<br>%C10KGE1H-3-SFP_MISSING: Interface GigabitEthernet3/0/0, Gigabit ethernet module (SFP) missing<br>%C10K_ALARM-6-INFO: ASSERT CRITICAL GigE1H 3/0/0 C10K Gigabit Ethernet SFP module missing |
| The SFP module not present followed by SFP module insertion. | Facility Alarm: “SFP Missing” alarm asserted when the SFP module is missing, cleared when the SFP module is inserted, | %C10K_ALARM-6-INFO: ASSERT CRITICAL GigE1H 2/1/0 C10K Gigabit Ethernet SFP module missing<br>%C10K_ALARM-6-INFO: CLEAR CRITICAL GigE1H 2/1/0 C10K Gigabit Ethernet SFP module missing<br>%C10KGE1H-6-SFP_OK: Interface GigabitEthernet2/1/0, 1000BASE-SX Gigabit ethernet module (SFP) inserted |
| A non-Gigabit Ethernet type Cisco-supported SFP module is inserted, removed, and replaced by a valid SFP module. | The FAIL LED will blink as long as the invalid SFP module causing the error situation is present. | %C10K_ALARM-6-INFO: ASSERT CRITICAL GigE1H 2/1/0 C10K Gigabit Ethernet SFP module bad<br>%C10KGE1H-3-SFP_NON_GIGE: Interface GigabitEthernet2/1/0, Inserted module not Gigabit ethernet module (SFP)<br>%C10KGE1H-3-SFP_MISSING: Interface GigabitEthernet2/1/0, Gigabit ethernet module (SFP) missing<br>%C10K_ALARM-6-INFO: ASSERT CRITICAL GigE1H 2/1/0 C10K Gigabit Ethernet SFP module missing<br>%C10K_ALARM-6-INFO: CLEAR CRITICAL GigE1H 2/1/0 C10K Gigabit Ethernet SFP module bad<br>%C10K_ALARM-6-INFO: CLEAR CRITICAL GigE1H 2/1/0 C10K Gigabit Ethernet SFP module missing<br>%C10KGE1H-6-SFP_OK: Interface GigabitEthernet2/1/0, 1000BASE-SX Gigabit ethernet module (SFP) inserted |
| A non-Cisco supported SFP module is inserted, removed, and a Cisco-supported Gigabit Ethernet SFP module is inserted. | The FAIL LED will blink as long as the invalid SFP module causing the error situation is present. | %C10K-4-LC_WARN: Slot[2/1] Line-card SFP eeprom vendor area CRC check failed<br>%C10K_ALARM-6-INFO: CLEAR CRITICAL GigE1H 2/1/0 C10K Gigabit Ethernet SFP module missing<br>%C10K_ALARM-6-INFO: ASSERT CRITICAL GigE1H 2/1/0 C10K Gigabit Ethernet SFP module bad<br>%C10KGE1H-3-SFP_BAD_HW: Interface GigabitEthernet2/1/0, Gigabit ethernet module (SFP) has bad HW<br>%C10K_ALARM-6-INFO: CLEAR CRITICAL GigE1H 2/1/0 C10K Gigabit Ethernet SFP module bad<br>%C10K_ALARM-6-INFO: CLEAR CRITICAL GigE1H 2/1/0 C10K Gigabit Ethernet SFP module missing<br>%C10KGE1H-6-SFP_OK: Interface GigabitEthernet2/1/0, 1000BASE-SX Gigabit ethernet module (SFP) inserted |

*Table 18-4 SFPs and Cisco IOS Console Messages (continued)*

| Situation | Response/Description | Console Message |
|---|---|---|
| An SFP module with the same serial number as another SFP module is inserted. Both are Cisco-supported Gigabit Ethernet SFP modules. | The FAIL LED is blinking on the line card in which the second SFP module was inserted. | %C10KGE1H-6-SFP_OK: Interface GigabitEthernet1/0/0, 1000BASE-SX Gigabit ethernet module (SFP) inserted<br>%C10KGE1H-3-SFP_SPURIOUS: Interface GigabitEthernet1/1/0, Gigabit ethernet module (SFP) is a duplicate spurious<br>%C10K_ALARM-6-INFO: ASSERT CRITICAL GigE1H 1/1/0 C10K Gigabit Ethernet SFP module spurious |
| An SFP module hardware problem occurs. | The FAIL LED will blink when there is a TX fault as long as the invalid SFP module causing the error situation is present. | %C10K-3-LC_ERR: Slot[8/1] Line-card Port 0: GBIC HW TX Fault |

# Packet Over SONET Line Card Troubleshooting Information

Table 18-5 provides information on which symptom, possible cause, and corrective action apply to each of the Packet Over SONET line cards.

***Table 18-5 Packet Over SONET Line Card Troubleshooting Information***

| Symptom | Possible Cause | Corrective Action | OC-3/ STM-1 POS | OC-12 POS | OC-48/ STM-16 POS |
|---|---|---|---|---|---|
| The FAIL LED does not light when the line card is inserted into a slot. (The power on the line card has not turned on.) | The line card is not properly seated. | Be sure the ejector levers are closed and the captive screws tightened. | Y | Y | Y |
| | Bad line card connector or bad backplane connector. | 1. Carefully check both the line card backplane connector and chassis backplane connector for bent or damaged pins. If the line card has damaged pins, replace the line card. If the backplane connector has damaged pins, replace the chassis or temporarily move the line card to another slot.<br>2. Remove the line card and put it in another chassis slot. | | | |
| | Defective line card. | Replace the line card. | | | |
| | Chassis not powered on or PRE not in chassis. | Check that the chassis power supplies are turned on and that the PRE is powered up. | | | |
| The FAIL LED blinks at the rate of 10 times per second when the line card is inserted into a slot. (The line card has detected a slot parity error.) | The line card is not properly seated. | Be sure the ejector levers are closed and the captive screws tightened. | Y | Y | Y |
| | Bad line card connector or bad backplane connector. | 1. Carefully check both the line card backplane connector and chassis backplane connector for bent or damaged pins. If the line card has damaged pins, replace the line card. If the backplane connector has damaged pins, replace the chassis or temporarily move the line card to another slot.<br>2. Remove the line card and put it in another chassis slot. | | | |
| | Defective line card. | Replace the line card. | | | |

*Table 18-5 Packet Over SONET Line Card Troubleshooting Information (continued)*

| Symptom | Possible Cause | Corrective Action | OC-3/ STM-1 POS | OC-12 POS | OC-48/ STM-16 POS |
|---|---|---|---|---|---|
| The FAIL LED blinks at a slower rate than 10 times per second when the line card is inserted into a slot. | The line card is experiencing an error while trying to boot and is either resetting itself or being reset by the PRE.<br>The line card has been recognized by Cisco IOS but is experiencing an issue while running functional code. | 1. Be sure the ejector levers are closed and the captive screws tightened.<br>2. Carefully check both the line card backplane connector and chassis backplane connector for bent or damaged pins. If the line card has damaged pins, replace the line card. If the backplane connector has damaged pins, replace the chassis or temporarily move the line card to another slot.<br>3. Remove the line card and put it in another chassis slot.<br>4. Replace the line card. | Y | Y | Y |
| The FAIL LED never turns off after the line card has been inserted. (The line card is not coming up out of reset.) | The line card is not properly seated. | Be sure the ejector levers are closed and the captive screws tightened. | Y | Y | Y |
| | Bad line card connector or bad backplane connector. | 1. Carefully check both the line card backplane connector and chassis backplane connector for bent or damaged pins. If the line card has damaged pins, replace the line card. If the backplane connector has damaged pins, replace the chassis or temporarily move the line card to another slot.<br>2. Remove the line card and put it in another chassis slot. | | | |
| | Cisco IOS is configured to hold the card in reset. | Verify that the slot is not being held in reset by the Cisco IOS configuration. | | | |
| | Defective line card. | Replace the line card. | | | |

*Table 18-5 Packet Over SONET Line Card Troubleshooting Information (continued)*

| Symptom | Possible Cause | Corrective Action | OC-3/ STM-1 POS | OC-12 POS | OC-48/ STM-16 POS |
|---|---|---|---|---|---|
| With the optical fiber cable connected and the line card configured under Cisco IOS, the CARRIER LED does not illuminate. | The optical fiber cable is not seated correctly. | Unplug and replug the optical fiber cable. | Y | Y | Y |
| | The optical fiber cable is plugged in backwards. | Verify that the transmit of the far end is plugged into the receive of the Cisco 10000 equipment and vice versa. | | | |
| | The optical fiber cable is dirty. | Clean the optical fiber cable on both ends. See the "Cleaning the Fiber-Optic Connections" section on page 18-24. | | | |
| | The equipment at the far end of the optical fiber cable is not operational. | Verify that the far end is enabled and actively sending a signal down the optical fiber cable. | | | |
| | The optical fiber cable is the incorrect type. | Use the correct type of the optical fiber cable for the line card. | | | |
| | Far-end optics do not match the line card optics. | Make sure the far-end optics match the line card optics. | | | |
| | The optical fiber cable is too long. | If the optical fiber cable being used is longer than the standards allow, use a standards-compliant length of optical fiber cable for the line card. | | | |
| | The optical fiber cable is too short. | If the optical fiber cable is too short, the optical receiver can be overpowered. Use an attenuator or a longer optical fiber cable to adjust the optical power seen at the Cisco 10000 line card. Be sure to calculate the optical power budget. | | | |
| | The optical fiber cable is broken. | As an experiment to isolate the failure, use a small loopback cable to connect the Cisco 10000 line card to itself. If the LED lights under this condition, continue to investigate cable or far-end equipment failure. Try replacing the optical fiber cable. | | | |
| | The line card is defective. | Replace the line card. | | | |

# Unchannelized E3/T3 Line Card Troubleshooting Information

Table 18-6 provides information on which symptom, possible cause, and corrective action apply to the unchannelized E3/T3 line card.

***Table 18-6 Unchannelized E3/T3 Line Card Troubleshooting Information***

| Symptom | Possible Cause | Corrective Action |
|---|---|---|
| The FAIL LED does not light when the line card is inserted into a slot. (The power on the line card has not turned on.) | The line card is not properly seated. | Be sure the ejector levers are closed and the captive screws tightened. |
| | Bad line card connector or bad backplane connector. | 1. Carefully check both the line card backplane connector and chassis backplane connector for bent or damaged pins. If the line card has damaged pins, replace the line card. If the backplane connector has damaged pins, replace the chassis or temporarily move the line card to another slot.<br>2. Remove the line card and put it in another chassis slot. |
| | Defective line card. | Replace the line card. |
| | Chassis not powered on or PRE not in chassis. | Check that the chassis power supplies are turned on and that the PRE is powered up. |
| The FAIL LED blinks at the rate of 10 times per second when the line card is inserted into a slot. (The line card has detected a slot parity error.) | The line card is not properly seated. | Be sure the ejector levers are closed and the captive screws tightened. |
| | Bad line card connector or bad backplane connector. | 1. Carefully check both the line card backplane connector and chassis backplane connector for bent or damaged pins. If the line card has damaged pins, replace the line card. If the backplane connector has damaged pins, replace the chassis or temporarily move the line card to another slot.<br>2. Remove the line card and put it in another chassis slot. |
| | Defective line card. | Replace the line card. |
| The FAIL LED blinks at a slower rate than 10 times per second when the line card is inserted into a slot. | The line card is experiencing an error while trying to boot and is either resetting itself or being reset by the PRE.<br>The line card has been recognized by Cisco IOS but is experiencing an issue while running functional code. | 1. Be sure the ejector levers are closed and the captive screws tightened.<br>2. Carefully check both the line card backplane connector and chassis backplane connector for bent or damaged pins. If the line card has damaged pins, replace the line card. If the backplane connector has damaged pins, replace the chassis or temporarily move the line card to another slot.<br>3. Remove the line card and put it in another chassis slot.<br>4. Replace the line card. |

*Table 18-6 Unchannelized E3/T3 Line Card Troubleshooting Information (continued)*

| Symptom | Possible Cause | Corrective Action |
|---|---|---|
| The FAIL LED never turns off after the line card has been inserted. (The line card is not coming up out of reset.) | The line card is not properly seated. | Be sure the ejector levers are closed and the captive screws tightened. |
| | Bad line card connector or bad backplane connector. | 1. Carefully check both the line card backplane connector and chassis backplane connector for bent or damaged pins. If the line card has damaged pins, replace the line card. If the backplane connector has damaged pins, replace the chassis or temporarily move the line card to another slot.<br>2. Remove the line card and put it in another chassis slot. |
| | Cisco IOS is configured to hold the card in reset. | Verify that the slot is not being held in reset by the Cisco IOS configuration. |
| | Defective line card. | Replace the line card. |
| With the BNC cable connected and the line card configured under Cisco IOS, the CARRIER LED does not illuminate. | The cable is not seated correctly. | Unplug and replug the cable. |
| | The cable is plugged in backward. | Verify that the transmit of the far end is plugged into the receive of the Cisco 10000 equipment and vice versa. |
| | The equipment at the far end of the cable is not operational. | Verify that the far end is enabled and actively sending a signal down the cable. |
| | The cable is broken. | As an experiment to isolate the failure, use a small loopback cable to connect the Cisco 10000 line card to itself. If the LED lights under this condition, continue to investigate cable or far-end equipment failure. Try replacing the cable. |
| | Defective line card. | Replace the line card. |

# Cleaning the Fiber-Optic Connections

For information about cleaning fiber-optic cable connectors and receptacles, see the *Inspection and Cleaning Procedures for Fiber-Optic Connections* document and the *Compressed Air Cleaning Issues for Fiber-Optic Connections* for more information on cleaning optical devices.

The *Inspection and Cleaning Procedures for Fiber-Optic Connections* document provides detailed illustrations and photos of procedures and equipment required to properly clean fiber-optic connections.

# Checking Flow Control

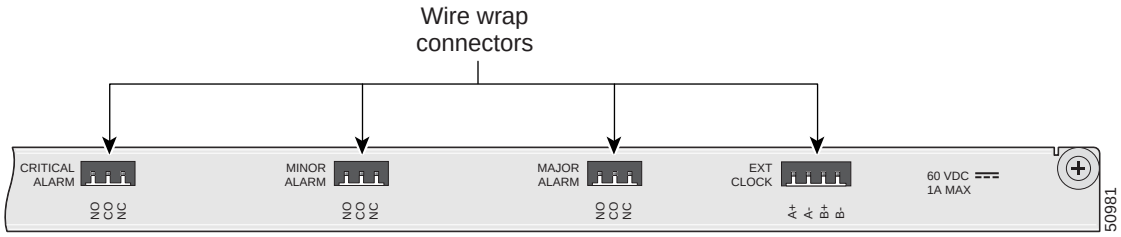
Each line card sends egress flowbits back to the PRE. The bus interface frame contains 64,000 flowbit opportunities. If there is service degradation on a line card, use the **show pxf cpu queue** command to display flowbit information. The command output includes the **Flowbit(period/offset)** field. The **period** output indicates how often the flowbits repeat themselves within the frame. The **offset** output indicates how to find the flowbit pertaining to a particular interface on that line card.

# Cisco 10005 Extender Card Information

All Cisco 10005 line cards connect to a backplane in the center of the chassis, and require extender cards to deliver the alarm, BITS clock, and DS3 signals to the rear of the chassis to make them accessible. The Cisco 10005 alarm extender card and T3/E3 extender card extend and terminate these signals.

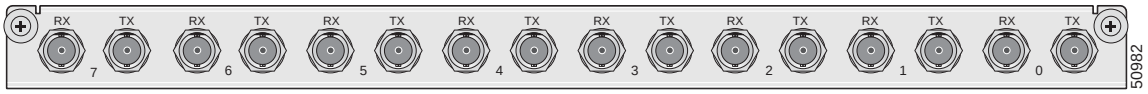
The alarm extender card slides into the bottom slot in the back of the chassis, and terminates the alarm signals with wire wrap header connectors (Figure A-1).

***Figure A-1 Alarm Extender Card***




The T3/E3 extender card extends the signals of the channelized T3 line card located in the slot directly opposite in the front of the chassis, and terminates the eight pairs of DS3 signals with BNC connectors (Figure A-2)

***Figure A-2 T3/E3 Extender Card***




# .Installation Guidelines

Before you perform the procedures in this guide, we recommend that you read Chapter 16, “Preparing for Installation.”

The Cisco 10005 system is hot-swappable, which means you can remove and replace line cards while the system is operating.

Be sure to remove the correct extender card. If you remove the alarm extender card, this disconnects the BITS clock and external alarm devices. If you remove the T3/E3 extender card, this stops all traffic to and from its associated CT3 line card.

**Caution** To prevent electrostatic discharge (ESD) damage, handle extender cards by the faceplate or the card carrier edges only. Avoid touching the extender card printed circuit board, components, or any connector pins.

## Required Tools and Equipment

The following tools and equipment are required to install an extender card:

- No. 1 Phillips screwdriver
- ESD-preventive wrist or ankle strap with connection cord

# Installing or Replacing Extender Cards

This section describes how to install or replace an extender card in the Cisco 10005 chassis, and contains the following procedures:

- Installing an Extender Card, page A-2
- Removing an Extender Card, page A-3
- Troubleshooting, page A-3

## Installing an Extender Card

You can only install the alarm extender card in the lowest slot in the rear of the Cisco 10005 chassis.

The T3/E3 extender card extends the DS3 signals of the channelized T3 line card, located in the slot directly opposite in the front of the chassis. For example, a T3/E3 extender card installed in the highest slot in the *rear* of the chassis extends the signals of the channelized T3 line card that is installed in the highest slot in the *front* of the chassis.

Use the following procedure to install an extender card into the rear of the Cisco 10005 chassis:

**Note** If you are replacing an extender card, see the "Removing an Extender Card" section on page A-3 before you begin this procedure.

**Step 1** Attach an antistatic wrist strap to your wrist and either to an ESD socket on the chassis or to a bare metal surface on the chassis or frame.

**Step 2** Hold the faceplate of the extender card with one hand and place your other hand under the card (to support the weight of the card). Position the card in front of the card cage slot.

**Step 3** Carefully align the left and right edges of the extender card with the left and right guides in the chassis, and slide the card into the slot until it begins to seat in the backplane connectors.

**Step 4** Securely tighten both captive screws on the extender card.

# Removing an Extender Card

Ensure that all wires or cables are disconnected from the extender card, and then use the following procedure to remove an extender card from the chassis:

**Step 1** Attach an antistatic wrist strap to your wrist and either to an ESD socket on the chassis or to a bare metal surface on the chassis or frame.

**Step 2** Loosen both captive screws on the extender card.

**Step 3** Hold the faceplate of the extender card with one hand and place your other hand under the card carrier (to support the weight of the card).

**Step 4** Slide the extender card out of the slot and place it on an antistatic surface or in an antistatic bag.

**Step 5** Cover the empty slot with a blank faceplate or install another extender card according to the "Installing an Extender Card" section on page A-2.

**Warning** **Blank faceplates (filler panels) serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they confine electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, power modules, and faceplates are in place.** Statement 156

# Troubleshooting

Table 1 provides tips for troubleshooting the extender cards.

***Table 1 Troubleshooting the Extender Card***

| Symptom | Possible Cause | Corrective Action |
|---|---|---|
| Extender card does not operate properly | 1. The card is not properly seated.<br>2. Bad extender card slot or midplane connector.<br>3. Bad interface connector on the extender card.<br>4. Bad extender card. | 1. Reseat the card in its slot. Be sure the captive screws are tight.<br>2. Remove the extender card and install it in another chassis slot.<br>3. Replace the extender card.<br>4. Replace the extender card. |

## A

ATM line cards, troubleshooting 18-2

## B

bale clasp-type SFP module 17-46
BNC connectors, Cisco 10005 15-8
BNC connectors, Cisco 10008 17-38, 17-39

## C

cable bracket, optical fiber 17-34
cables
  coaxial 17-37
cables, connectors, and pinouts
  24-Port Channelized E1/T1 line card 5-7
  8-Port Fast Ethernet Half-Height line card 9-6
cables and connectors
  1-Port Channelized OC-12 ATM line card 3-6
  1-Port Gigabit Ethernet line card 11-6
  1-Port OC-12 Packet Over SONET line card 13-7
  1-Port OC-48/STM-16 Packet Over SONET line card 14-7
  4-Port Channelized OC-3/STM-1 line card 7-8
  4-Port Channelized T3 Half-Height line card 4-6
  6-Port Packet Over SONET line card 12-7
captive screws 17-15, 17-25
channelized line cards, troubleshooting 18-6
checking the installation 17-58
Cisco 10005 alarm extender card 19-1
Cisco 10005 router rear, BNC connectors 15-8
Cisco 10005 router rear, identification 15-6
Cisco 10005 T3/E3 extender card 19-1
Cisco 10008 router rear, identification 17-38, 17-39
cleaning procedures for fiber-optic connections 18-24
coaxial cables 17-37
compatibility, hardware
  1-Port Channelized OC-12/STM-4 line card 6-3
  1-Port Channelized OC-12 ATM line card 3-2
  24-Port Channelized E1/T1 line card 5-4
  4-Port Channelized T3 Half-Height line card 4-2
  4-Port OC-3/STM-1 ATM line card 1-3
  6-Port Channelized T3 line card 8-2
  8-Port E3/DS3 ATM line card 2-3
  Cisco 10000 4-Port Channelized STM-1 line card 7-3
configuration summary, 4-Port Channelized T3 Half-Height line card 4-9, 17-41
configuring a line card 17-60

## E

ejector levers 17-14
ejector levers, half-height line cards 17-24
electrical equipment guidelines 16-2
electrostatic discharge 16-3
ESD socket 17-11, 17-19, 17-48, 17-52

## F

Fast Ethernet line cards, troubleshooting 18-11
fiber-optic cleaning procedures 18-24
fiber-optic connectors
  cleaning procedures 18-24
front cover, removing 17-8
full size line cards, installing 17-10

## G


GBIC
- 1000BASE-LX/LH 11-7
- 1000BASE-SX 11-7
- 1000BASE-ZX 11-7

GBIC, SFP online insertion and removal 10-8, 11-6, 17-27

GBIC module
- guidelines 17-26
- inserting 17-31
- installing 17-26

GBIC-SX 10-11

Gigabit Ethernet
- GBIC transmit power, receive power, and power budget 10-10
- SFP and GBIC module mode conditioning patch cords 10-11, 11-8
- SFP transmit power, receive power, and power budget 10-10

Gigabit Ethernet line cards, troubleshooting 18-11

guidelines, SFP modules or GBIC modules 17-26


## H


half-height cards, installing 17-16

half-height line card carrier
- inserting 17-20
- installing 17-16
- product identification 17-17
- specifications 17-16

handling line cards 17-1

hardware compatibility
- 1-Port Channelized OC-12/STM-4 line card 6-3
- 1-Port Channelized OC-12 ATM line card 3-2
- 24-Port Channelized E1/T1 line card 5-4
- 4-Port Channelized T3 Half-Height line card 4-2
- 4-Port OC-3/STM-1 ATM line card 1-3
- 6-Port Channelized T3 line card 8-2
- 8-Port E3/DS3 ATM line card 2-3
- Cisco 10000 4-Port Channelized STM-1 line card 7-3


## I


identification
- line card slots 17-3
- line card subslots 17-3

inserting a half-height line card 17-23

installing a half-height card into a carrier 17-21

installing GBIC modules 17-26

installing half-height cards 17-16

installing SFP modules 17-26


## L


laser/LED safety 16-3

LEDs
- 1-Port Channelized OC-12/STM-4 line card 6-3
- 1-Port Channelized OC-12 ATM line card 3-3
- 1-Port Gigabit Ethernet Half-Height line card 10-4
- 1-Port Gigabit Ethernet line card 11-3
- 1-Port OC-12 Packet Over SONET line card 13-3
- 1-Port OC-48/STM-16 Packet Over SONET line card 14-3
- 24-Port Channelized E1/T1 line card 5-4
- 4-Port Channelized T3 Half-Height line card 4-3
- 4-Port OC-3/STM-1 ATM line card 1-3
- 6-Port Channelized T3 line card 8-3
- 6-Port Packet Over SONET line card 12-3
- 8-Port E3/DS3 ATM line card 2-3
- 8-Port Fast Ethernet Half-Height line card 9-3
- 8-Port Unchannelized E3/T3 line card 15-3
- Cisco 10000 4-Port Channelized OC-3/STM-1 line card 7-3

line card
- captive screws 17-21
- installing 17-10
- slot locations 17-3
- subslot locations 17-3

line card, router, and processor compatibility
- 1-Port Channelized OC-12/STM-4 line card 6-3

1-Port Channelized OC-12 ATM line card 3-2
1-Port Gigabit Ethernet Half-Height line card 10-3
1-Port Gigabit Ethernet line card 11-2
1-Port OC-48/STM-16 Packet Over SONET line card 14-3
24-Port Channelized E1/T1 line card 5-4
4-Port Channelized T3 Half-Height line card 4-2
4-Port OC-3/STM-1 ATM line card 1-3
6-Port Channelized T3 line card 8-2
6-Port Packet Over SONET line card 12-2
8-Port E3/DS3 ATM line card 2-3
8-Port Fast Ethernet Half-Height line card 9-2
8-Port Unchannelized E3/T3 line card 15-2
Cisco 10000 4-Port Channelized OC-3/STM-1 line card 7-3
locations 17-3
line card subslots 17-3


## M


minimum software release
1-Port Channelized OC-12/STM-4 line card 6-2
1-Port Channelized OC-12 ATM line card 3-1
1-Port Gigabit Ethernet Half-Height line card 10-1
1-Port Gigabit Ethernet line card 11-1
1-Port OC-12 Packet Over SONET line card 13-1
1-Port OC-48/STM-16 Packet Over SONET line card 14-1
24-Port Channelized E1/T1 line card 5-1
4-Port Channelized T3 Half-Height line card 4-1
4-Port OC-3/STM-1 ATM line card 1-1
6-Port Channelized T3 line card 8-1
6-Port Packet Over SONET line card 12-1
8-Port E3/DS3 ATM line card 2-1
8-Port Fast Ethernet Half-Height line card 9-1
8-Port Unchannelized E3/T3 line card 15-1
Cisco 10000 4-Port Channelized OC-3/STM-1 line card 7-2
mode conditioning Gigabit Ethernet patch cord description 10-11, 11-8


## O


OIR 17-2
online insertion and removal 17-2
optical cable
connecting 17-34
optical fiber cable bracket 17-34


## P


physical specifications
1-Port Channelized OC-12/STM-4 line card 6-4
1-Port Channelized OC-12 ATM line card 3-4
1-Port Gigabit Ethernet Half-Height line card 10-5
1-Port Gigabit Ethernet line card 11-4
1-Port OC-12 Packet Over SONET line card 13-4
1-Port OC-48/STM-16 Packet Over SONET line card 14-5
24-Port Channelized E1/T1 line card 5-5
4-Port Channelized OC-3/STM-1 line card 7-5
4-Port Channelized T3 Half-Height line card 4-4
4-Port OC-3/STM-1 ATM line card 1-4
6-Port Channelized T3 line card 8-4
6-Port Packet Over SONET line card 12-4
8-Port E3/DS3 ATM line card 2-4
8-Port Fast Ethernet Half-Height line card 9-4
8-Port Unchannelized E3/T3 line card 15-4
Gigabit Ethernet GBIC module 11-7
Gigabit Ethernet SFP Module 11-7
POS line cards, troubleshooting 18-20
preventing electrostatic discharge damage 16-3


## R


related documentation xix
removing a half-height line card and carrier 17-51
removing optical fiber cables 17-44
replacing line cards, same slot 17-10, 17-16
router, front cover 17-8

## S

safety 16-1
SFP module
  bale clasp type 17-46
  guidelines 17-26
  inserting 17-29
  installing 17-26
  latch types 17-26
  software alarm messages 18-17, 18-18
software and hardware compatibility 1-2
specifications, carrier for half-height line cards 17-16
subslot locations identified, Cisco 10005 15-8
subslot locations identified, Cisco 10008 17-38, 17-39

## T

T1 connections 8-2
T3 connection 8-2
telephone wiring guidelines 16-2
tools and equipment required for installation 16-1
troubleshooting
  ATM line cards 18-2
  channelized line cards 18-6
  Fast Ethernet and Gigabit Ethernet line cards 18-11
  POS line cards 18-20
  SFP module alarm messages 18-17, 18-18
  Unchannelized E3/T3 line card 18-23

## U

Unchannelized E3/T3 line card, troubleshooting 18-23
using show commands to display line card information 17-59
using show commands to verify line card status 17-58, 17-59
using the ping command to verify network connectivity 17-59

## W

warnings
  Class 1 laser product 17-27
  Class 1 LED product 17-27
  laser radiation 17-27

## Y

Y-cable, optional 4-7, 5-8, 17-36, 17-39, 17-40